ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

Electric Light, Power, Telephone, Telegraph and Scientific Progress.

VOL. 20. No. 24. WEEKLY. | NEW YORK, SATURDAY, AUGUST 6, 1892. | $3 per Annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

VIEWS, NEWS AND INTERVIEWS.

During the investigation of the Homestead labor trouble before the Congressional Investigating Committee, Mr. Frick, the executive head of the Carnegie interests, was questioned by Congressman Boatner as to how the Pinkerton men and their firearms were secured.

"At what time were your arrangements with the Pinkertons completed to obtain these men?" asked Mr. Boatner.

"About the first of July, I think. Having a long distance telephone connecting our New York office with our Pittsburgh office, we are enabled to talk there at any time, just as we do in the city," replied Mr. Frick.

"You were advised, then, by telephone of your ability to get these men?"

"Yes, sir."

This seems to have constituted a verbal agreement between Mr. Frick and the Pinkerton agents, and illustrates the importance of the long distance telephone in cases of emergency.

While the electric fan is one of the solaces of summer and has developed from a luxury to almost a necessity, due caution should be observed in its use. A Chicago gentlemen recently came into his office in a very much overheated condition and sat down at his desk in the full breeze of an electric fan. He contracted a heavy cold, which developed into pneumonia and necessitated a nine-weeks' sojourn in a hospital. The electric fan is all right, but its use must be accompanied by discretion.

A St. Petersburg inventor has on exhibition a clock with a phonograph attachment, the dial of which is a human face, from whose mouth comes the announcement of the hours, as well as any directions that may be left with it.

Andrew Carnegie's present prominence before the public recalls to a writer in *Harper's Weekly* an exploit of his youth, soon after he became a telegraph operator at Pittsburgh, nearly 40 years ago. Because of the high water in Ohio, the smokestack of a steamboat had carried away the wires across the river at Steubenville, and young Carnegie, who was then barely 16 years old, was sent to take care of the messages until the line could be repaired. He received the messages coming from the West, and despatched them by boat to Wheeling every few hours, accomplishing the task so skillfully that soon after his return to the main office he was promoted.

It is really surprising what electricity can do in the opinion of some people, says London *Lightning*. An apparently sane and perfectly respectable man applied to Mr. Denman in the police court last week for protection against Lord Londesborough and another, who were "trying to kill his father with poison conveyed into the house by means of electricity." Why, or how, or in what form, this scientist did not condescend to explain.

Hang a wet towel in front of your electric fan and you will find that your room or office will be much cooler. Moist air is better than dry air for cooling purposes.

An Electrical Coal-Cutting Syndicate.

A new and rather important departure in company enterprise has recently made its appearance in the north of England. This is an association for the purpose of coal-cutting by means of electricity. The company will take over mines from their owners, install electric coal-cutting plant, and carry out the whole of the work in connection with coal production themselves at a fixed contract price, probably about one

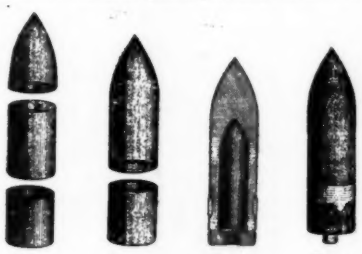


FIG. 1. FIG. 2. FIG. 3. FIG 4.

FORMATION OF ELECTRIC WELDED PROJECTILES.—(See page 306.)

shilling per ton. If it has an extended field, and to judge from the strength of the board and the warmth with which it has been supported there is every prospect that it will have, the effect upon the mining districts will be simply revolutionary. Electrical coal-cutting is not only far cheaper than hand labor, but practically dispenses with it, so far as the cramping and stunting department of hewing is concerned. Thus an enormous number of outspoken and able-bodied men are liable to be thrown out of employment, unless the increased rate of production enables a correspondingly increased number of men to be employed in healthier work above bank. The list of the board representing this electrical coal-cutting contract corporation includes at present the names of Sir Archibald Campbell, Mr. Lindsay Wood (chairman of the Durham Coal-owners' Association), Mr. Frank Stobart (representing Lord Durham), Mr. James Knowles (of Pearson & Knowles, Wigan), the Hon. G. W. Winn and Mr. W. T. Goolden. It would be almost impossible to put together a more influential or representative syndicate, and the effects of its formation upon the industry will be watched with great interest.—*London Lightning.*

The Proposed Cable to Honolulu.

The presiding officer of the Senate on July 27 laid before that body a message from the President, with accompanying papers, relative to the practicability of laying a telegraph cable between California and the Hawaiian Islands. Secretary Tracy of the Navy Department, in a letter, states that the result of the survey shows that a practicable route can be easily selected. The report of the hydrographic office of the Bureau of Navigation states that the survey shows that the laying of the cable on almost any line between California and the Hawaiian Islands is practicable. A lane about 300 miles wide was developed between California and Hawaii, and the results, as shown in the report, seem to indicate the most favorable route to be a line between Monterey Bay, Cal., and Honolulu.

Nothing New Under the Sun.

The unearthing of forgotten work, though too often done for the purpose of disparaging the researches of modern physicists, and which is done in the spirit of not allowing a person the credit of original work, if it can be possibly proved that someone else has anticipated him, brings to light much that is of historical interest. In an article in the ELECTRICAL REVIEW, of New York, Mr. P. H. Van der Weyde gives an extract from "Philosophy of Renatus des Cartes," published in Amsterdam in 1690, in which magnetic lines of force, as shown by means of iron filings, are described and illustrated. Des Cartes calls them *lines of attraction*, and says that the filings become arranged in an order which shows sufficiently that there is around this body a kind of vortex, or rather an atmosphere of a very subtle matter, *because it passes* through the pores of the glass; it extends from one pole of the magnet to the other, and arranges itself so as to form arcs of circles, which appear to proceed from one pole A, to enter again into the magnet through the other pole B. Des Cartes also gives illustrations of the earth's magnetism, showing the increased inclination or dip of the compass needle at high latitudes, and also illustrates the hypothesis that the theory of magnetic and electric action involves rotary motion of the molecules and of the ether surrounding them, and this in opposite directions, as shown by the right hand and left hand windings of the lines on the particles. —*London Electrical Review.*

Thin Active Coatings in Accumulators.

In central station work it is a matter of little or no importance whether the accumulators charge and discharge at anything like the same pressure or not, remarks London *Industries*. In private houses the conditions are somewhat different. We do not care to

FIG. 5. FIG. 6. FIG. 7.

FIG. 8. FIG. 9. FIG. 10.

DETAILS OF ELECTRIC WELDED SHRAPNEL SHELL.—(See page 306.)

be involved in the internecine war referred to a fortnight ago, but if the high back electromotive force of charging and the high initial discharging pressure of a cell is due to strong acid in the active coatings, it is clear that thin coatings are the best for private houses, as high charging pressures are there troublesome. Unfortunately, the strong acid theory does not altogether fit in with the facts, as an E. P. S. cell goes down to just over two volts immediately, whereas the strong acid theory would make its discharge curve follow the charging curve, a slight depression being caused by the diffusion of the acid and the resistance. It also seems impossible to make a thinly coated cell that can be charged quickly at a low pressure and that will last.

LIGHT AND POWER STATIONS.

SOME HINTS TO OWNERS AND OPERATORS BY A PRACTICAL ENGINEER.

Serious Questions for Investors to Consider—Importance of Properly Designing a Plant—Foresight is Better Than Hindsight—What the Consulting Engineer Should do—Get a Good Manager.

BY ROBB MACKIE.

III.

The time has come when those who have put their money into electrical enterprises or who contemplate investing in them should fully realize that there are serious questions which have to be weighed and carefully considered in regard to the location of the plant, the best class of machinery to install and many other problems which are unknown to the uninitiated, before it is safe to undertake the installation of even the smallest of electrical plants.

It is of vital importance that these questions be given proper consideration, for upon the conception and execution of these plans will depend the dividend earning capacity of the plant.

For this work it is not now necessary to employ an engineer to give his undivided attention to any one station, unless it be one of the mammoth enterprises of the day, but owners and contemplating investors will find many capable men to whom they can submit their plans, and that by taking this precaution many dollars of useless expenditure will be saved, not only in the first cost of the plant, but in the operating expenses as well.

Too much importance cannot be laid upon the necessity of having a plant, whether large or small, designed by one who is thoroughly posted in such matters, and it will be found in the operation of the plant, oftentimes in the increased profits of the first year, there will be returned, many fold, the expense incurred in employing a man to do this work who has the reputation of an engineer who has accomplished good and successful work.

Investors in electrical enterprises should proceed upon the same plan that would be followed if they were investing in an iron works, a gas or water works, or any of the industries that call for a knowledge of applied science, and as in these other enterprises they follow certain well defined rules to an assured success, so should they proceed with due caution and able advice in embarking in an electrical undertaking, than which there is none which requires more careful forethought at its inception to insure a successful life.

To attain this much-to-be-desired goal the investor should prepare for and run his race about on the following lines:

Having secured the services of an unbiased and independent engineer, have him

First. Go over the entire ground and determine upon the plans to be followed.

Second. Prepare specifications for the plant and advise as to purchase of the machinery.

Third. Inspect the plant from time to

time as the same is under construction, in order to hold contractors up to specifications.

Fourth. Make final inspection, take charge of test run and accept when everything is complete according to specifications.

Fifth. To organize the operating force for best results.

Sixth. To introduce a system of accounts and reports, etc., from which condition of the plant can, at all times, be determined.

Seventh. To regularly inspect the condition of the property and advise in regard to same, and generally act in an advisory capacity.

But all of this will be a useless waste of time unless the enterprise be intrusted to a careful business manager after it is launched upon its journey. So much of the resultant success or failure depends upon the "man at the wheel" in such an enterprise that it is simply astounding to see some of the men to whose reckless hands have been confided so many of the electrical plants of the country.

It is well at this time to point out that there is a decided tendency all over the country to cut down the prices paid for street lighting. Whether there is justice in this and whether a plant can be operated at a fair profit selling lights under city contracts for less than $100 per year each is not pertinent to the question.

The fact remains that there is a serious tendency in the direction of reduction of prices paid for city lighting. The result is that many operating companies are being compelled to look to other sources for their profits than to the "good city contracts."

In plants where good business has prevailed the "commercial" business has been built up upon a paying basis, and many of these plants are even now extending their lines into the residence districts for "domestic" service.

These are the directions for the expenditure of energy on the part of station owners and those who have not done so already will be surprised to find how quickly they can build up a good paying "commercial" and "domestic" business if they only go about it properly.

This will be all the more easy of achievement if the plant is properly handled, if the apparatus at the station and the lines are kept up to thoroughly good standard condition, and if the service is such that the consumer feels as reasonably sure of having electric service when he commences using it as he does of his gas or water or oil. Service of this character *can* be given, and, astonishing as it may seem to some, given at a greater profit than where it is bad and subject to interruptions, and I think it safe to say that many stations now running behind the returns could be made to pay if proper business methods were introduced and strictly followed. I believe it to be a fair truism to all concerned that the percentage of efficiency of the business and electrical ability displayed in the management of a plant can invariably be determined by the frequency of shut downs, and the just complaints of customers of poor service and demands for rebates.

Before passing to the discussion of other important matters let me call the attention of the owners of plants to an important factor in the successful operation of electrical, as well as of other, business, which seems to be constantly overlooked. I refer to the class of men they have who come in contact with customers.

Watch this as carefully as you do in your own store or office, and see to it that the manners of the pirate and highwayman, I regret to say a not unusual condition in many places I have been in, do not prevail among your construction men, trimmers, etc., who come in contact with those to whom you are selling your lights or power, and you will be surprised at the result, if such conditions have existed in the past.

(To be continued.)

New York Electric Club.

At the last regular meeting of the Board of Managers, the following gentlemen were elected members: J. F. Hughes, D. A. Patten, Alex. H. Bauer, H. J. Stanbaugh, J. H. Enholm, Harry S. Marlor, W. S. Hine, Edward Peck, Leonard F. Requa, J. H. Long, George E. Kent, A. G. Greenburg, F. H. Leonard, Jr., E. W. Seymour.

A Successful Ball Plant.

One of the most successful small electric light plants in the country is that at Lake Charles, La., a city of 3,500 inhabitants, beautifully situated on a lake of the same name. It was installed by the Enterprise Construction and Supply Company, of 167 Gravier street, New Orleans, who are the general Southern agents of the Ball Electric Light Company, of 404 West Twenty-seventh street, New York.

This plant consists of two 70 light, four ampere dynamos operated by a B. W. Payne & Sons 10x12 center crank automatic engine, and is owned by Messrs. J. A. Landry & Company, of Lake Charles, who deserve great credit for their enterprising spirit and the manner in which they push everything which is of interest to the beautiful little city in which they have cast their lot.

The electric plant, which is operated in connection with an ice works, furnishes 70 of the Ball 800 candle-power arc lamps, 140 sixteen candle-power and 64 twenty-five candle-power incandescents. The incandescents are distributed in series, along with the arcs, over two circuits, and the dynamos are so connected that either can be operated on both circuits, or on either of the two circuits. Messrs. Landry & Company run *both* dynamos in the evening and early part of the night, and when fewer lights are required they stop one and operate both circuits with the other.

The Ball Electric Light Company should be proud of this plant. Their agents have demonstrated beyond a doubt, in Lake Charles, the fact that both arc and incandescent lamps can be successfully operated on the same circuit, and to the entire satisfaction of consumers. The life of these lamps is said to be something wonderful, being really greater than that of the ordinary high resistance lamp. The Enterprise Construction and Supply Company have also been highly complimented by the New Orleans Board of Fire Underwriters who have had the plant inspected and who have no fault to find.

This plant is one which pays a handsome dividend, and the owners do not hesitate to give the Ball apparatus due credit for its excellence.

Electric Welded Projectiles.

BY HIRAM PERCY MAXIM, IN "PROCEEDINGS OF THE UNITED STATES NAVAL INSTITUTE."

Ordinance experts and military men generally have lately been much interested in a new method of making projectiles. This is the electric welding process used by the American Projectile Company, of Lynn, Mass., and from the success so far achieved it certainly seems that an important step in advance has been made in the manufacture of steel shell.

The American Projectile Company was organized a little more than a year ago, to engage in the practical manufacture of all kinds of projectiles, and having been given contracts by both the navy and army, have, since that time, equipped their shops with the necessary special plant, and are now, after a great deal of experimental work, manufacturing on a regular business basis.

All ordinance experts well know the tedious and difficult processes at present used in producing the different kinds of forged steel projectiles. Steel castings for this purpose having long since been abandoned on account of the difficulty in obtaining the desired results and the expense of the castings themselves, it has been, up to the present time, a question of high grade and expensive armor-piercing projectiles and ordinary cast iron ones for common use. It has been rendered possible by the invention of electric welding, and is now one of the aims of the American Projectile Company, to produce a forged steel shell at about the same price as it now costs to manufacture the common cast iron projectile. This is accomplished in the following manner:

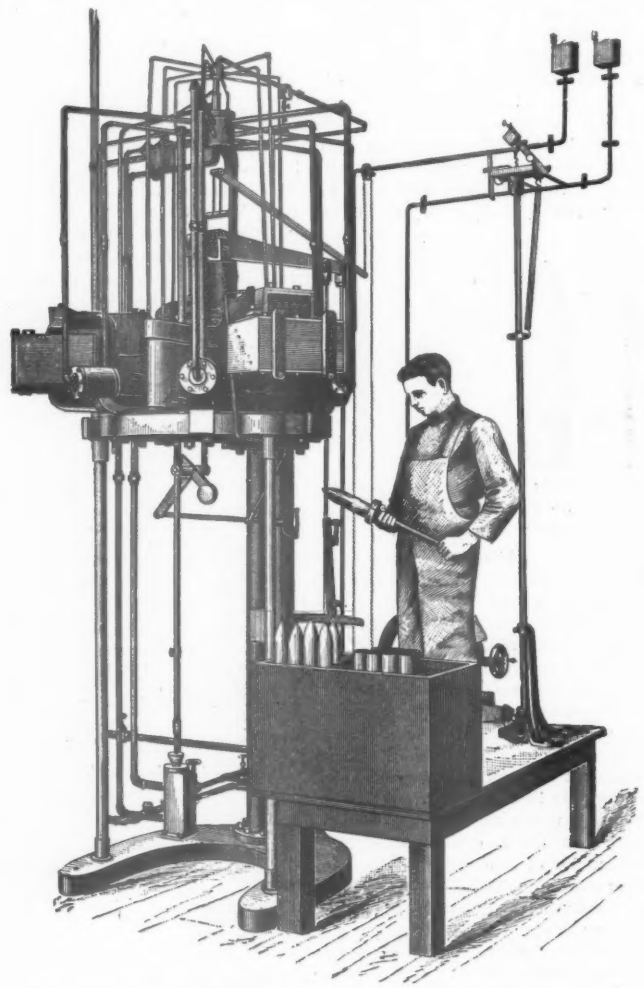


FIG. 11.—ELECTRIC WELDING MACHINE FOR SMALL PROJECTILES.

1. Hollow steel blooms are cast, and from them is rolled out a thick-walled tube, having the approximate finished dimensions of the body of the shell. This is then cut into suitable lengths and to the short blanks thus made are joined, by electric welding, the head and base of the projectile, which have been previously formed in suitable dies. After this is done the only machining necessary is turning to gauge on the outside, cutting the rotating band score and the fuse thread and seat. This projectile is afterwards hardened, and thus is produced, in this very cheap manner, a thoroughly efficient wrought steel shell. It will be understood that this is not the high grade armor-piercing shell, but a shell that can be used very efficiently against armor of moderate thickness, and will, in other respects, fulfill the offices of the common shell, at the same time costing no more than the cast iron now in use. This, of course, is a very important feature, as it will enable the government, without any additional cost, to fill the magazines with this much better grade of shell, which may, in time of peace, be used for target practice, etc., and still be on hand for efficient service in case of war. The company are now filling two large contracts for the navy for shell of this character—one for 80 pound projectiles for the four-inch rapid-fire gun and the other for six-inch common shell.

Fig. 1 illustrates the formation of this projectile, although, in this illustration, the midships section of tubing should be longer, and the head and base pieces proportionately short. To understand the simplicity of the welding operation it must be understood that it is only necessary to place these three pieces in contact, one above the other, in an electric welding machine, designed for the purpose, and by means of the electric current, which is passed from one pole to the other through the joint which is to be made, the metal at this point is quickly heated to a welding heat, and being kept in close contact by mechanical pressure, so unites at this point as to become homogeneous and equally strong with the rest of the metal. The surplus metal or burr, formed by the pressure, is mainly forced upwards, and is removed in the operation of truing the body of the shell. The operation of electric welding is so simple that it requires no expert to operate the machine, as any intelligent man can be taught in a very short time all that is necessary to produce a weld, impossible in any other way. Furthermore, it is feasible to weld the highest carbon steels; steels that are absolutely unweldable by any other process, one to another, or to weld a high carbon to a low grade steel, or even to wrought iron. The importance of this in projectile manufacture will be understood when it is seen that the head of a projectile may be made of high grade expensive steel, and as much of the balance as desired of cheaper, softer material. One who understands the difficulties of obtaining a perfect weld, when the metal has to be heated in the blacksmith's fire, will fully appreciate the great advantage obtained by this method, where the metal stands fully exposed to view in the open air and comes in contact with no impurities whatever, where the heat can be checked at any desired moment by the simple movement of a lever, and regulated as easily as the turning off or on of steam or air pressure.

These remarks apply to the ordinary operations of welding, but, of course, there are many forms which are practically impossible to the smith, and among them the tubular sections used in the manufacture of projectiles. The following will illustrate the strength of a weld of high carbon steel:

A six-pounder armor-piercing shell, fired at a recent test, slapped or "key-holed" slightly on striking the plate. It, however, passed through a four-inch iron plate whole, and when recovered it was found to be slightly bent directly at the region of the weld. The snap, as the shell straightened itself in the plate, had been so great that the square head of a brass plug, which was screwed into the fuse-hole, had actually been broken short off by the blow, leaving the threaded portion in the hole. Of course, this great strain, as shown by the bend, came directly on the section in which the weld was located, and this showed not the slightest sign of fracture.

The armor-piercing projectiles of this size are being manufactured in two pieces, as shown in Fig. 2, and in section in Fig. 3. In this case no tubing is used. Fig. 4 shows one of these projectiles that has been fired through a four-inch armor-plate. One of the marked peculiarities of these armor-piercing projectiles is the following:

The head section is hardened uniformly all over; the base section is not hardened at all. When the two pieces are joined by the electric welding, one of the features of which is limiting the heat to a short distance on either side of the joint, the shell is placed with a portion of the head in cold water, and thus the heat from the weld draws the temper gradually toward the point, thus leaving the base unhardened, and from it tapering to the necessary hardness at the point. Aside from this simple method of drawing the temper gradually toward the point, it will be seen that the hardening of the head alone is a very much less difficult operation than heating and hardening the whole projectile; also, that temper-cracks and other defects may be very easily distinguished in this portion of the shell before the base is welded on. This is considered one of the very important features covered by the patents of this company.

Another style of projectile now being manufactured is the shrapnel, for the army 3.2-inch field-piece, illustrated in section in Fig. 5 and in detail in Figs. 6, 7, 8, 9 and 10—Fig. 6 being the head forging, Fig. 7 the tubular midships section, Fig. 8 the steel diaphragm and central tube, forming, respectively, the powder chamber and the passage from the point fuse to it; Fig. 9 the base forging, showing the shoulder on which the diaphragm rests, and Fig. 10 the copper

rotating band, which is afterwards shown pressed on the shell in Fig. 5. The method of making this shrapnel is as follows:

The base piece and tube, Figs. 9 and 7, are placed in contact in the welding machine and joined together, forming a deep cup; while the weld is still hot, the diaphragm and tube are dropped into it so that the former rests on the shoulder of the powder chamber. The weld is then lightly swaged, thus locating the diaphragm firmly in place. Next, the head forging is placed in contact with the open end of the tube, and with the small central tube passing into the fuse-hole. This is then similarly joined by an electric weld. Afterwards the upper end of the small tube is crimped over a slight shoulder in the bottom of the fuse-hole. The outside of the shrapnel is then turned to gauge. A small hole is drilled in the head, communicating with the interior cavity; through this the shrapnel is filled with the necessary bullets; next, the matrix is poured in, and, finally, the hole is closed by a small plug which is screwed into place. Before the case is filled with the bullets and matrix it is hardened to give increased rigidity to the thin walls and to increase the number of fragments into which the case will burst. In trial, these shrapnel have given most excellent results.

So far, the largest shell being manufactured by the American Projectile Company are the six-inch naval common shell above referred to. These weigh, empty, 94 pounds and have an outside diameter of 5.96 inches, with a thickness of wall of 0.95 of an inch. It is expected, in the near future, that the company will undertake the manufacture of very much larger projectiles, as the only limit seems to be the possibility of obtaining the necessary tube, and arrangements are now being made to have this produced of the necessary dimensions to make as large as 12-inch shell.

It is believed that projectiles of the character described in the beginning of this article will be peculiarly adapted for use in mortar service against deck armor, etc., as they will have all the advantages of armor-piercing projectiles for penetrating that thickness of armor, and can be produced at a fraction of the cost of the more expensive missiles.

In conclusion, a brief description of one of the welding machines may be interesting. Fig. 11 shows one devoted to small size projectiles, such as the six-pounder armor-piercing and common shell. It stands high from the ground to enable the operator's helper to place and remove the shell being operated on from beneath. After placing the separate pieces of the shell in the machine from the under side, a movement of the hand lever in front of the operator throws in a set of hydraulic contacts through which the electric current passes to the portions of the shell they enclose. This current is obtained by transforming the primary current of 200 volts and about 250 amperes into a current of one-half a volt and consequently enormous quantity. The current is perfectly controlled by a switch, operated by a foot lever and in connection with a reactive coil. To carry this great current, heavy copper castings are necessary, which are kept cool by water-jackets and a continuous circulation of water. These water connections, for cooling and for pressure purposes, are shown by the numbers of pipes and tubes at the top of the machine. To give the necessary pressing together when the shell is at the welding heat, another hydraulic cylinder is provided. This is controlled by a lever conveniently placed. After the weld is finished, the assistant quickly carries the shell to a small hammer, where the burr is lightly swaged. It is then placed, head downward, in a shallow vat, to keep the temper from drawing out of the point.

The general construction of all the welding machines is extremely simple, the only thing requiring any particular care being to insure proper electrical contacts on the shell. This cut is taken from a photograph and shows the operator holding the freshly welded shell on its jig. This will give an idea of the local limit of the heat after the weld has been made.

In welding larger projectiles another style of machine is used. This is illustrated by Fig. 12. In this case the parts to be welded are placed upon the head of an hydraulic ram, which moves them upward into position as shown. The electric connection in this case is also made by hydraulic plungers in electrical connection with the induction coils, and they are caused to move in or out by means of a valve operated by the T-shaped handle shown near the top. A foot-lever actuates the switch, as in the smaller welding machine and a hand-lever shown on the right of the machine controls the upward pressure. The work at present being done by this machine is a section of eight square inches per weld, the operation being completed in 3½ minutes.

In describing the tubular shell of the four-inch type it should have been stated that these projectiles have already been successfully tried against thin armor and have exceeded in results what was expected of them.

A great number of special machines and appliances necessary for making this business a practical and financial success have been designed by Lieut. William Maxwell Wood, United States Navy, who is also the inventor of this system of manufacturing projectiles.

The Mexican Telephone Company.

The present position of this company is an indication as to the progress which the city is making, says the *Mexican Trader*. The company has now 900 subscribers and the number is daily increasing. For the convenience of the subscribers a new office is about to be opened in Monterilla street (near the Palacio de Hierro) to which 300 of the members will be attached. There will thus be two exchanges, the old one being called the Santa Isabel Street Exchange and the new one the Monterilla Street Exchange. It is hardly necessary to say that maintaining of two exchanges in the place of the one hitherto existing will considerably increase the cost, but the company is determined to give its subscribers the best possible service regardless of expense. The work of putting up the new iron poles in place of the somewhat unsightly wooden ones is proceeding apace. Fully 100 of the former are already in position, leaving about 50 to be erected. In addition to its telephonic business the company has recently been appointed agents for the Republic for the Western Electric Company, of New York, and carries in stock a large line of electric supplies, consisting of telephone, telegraph and electric light appliances, etc. The general manager of the company is Mr. J. E. Torbert and to his intelligent and unwearied efforts much of the recent progress of the company must be attributed. The company is doing a large and rapidly increasing wholesale and retail business. They have about three miles of cable up and working on the iron poles. The service is improving and the number of subscribers is increasing. President Colgate, of the company, recently returned to New York after a three months' absence in Mexico.

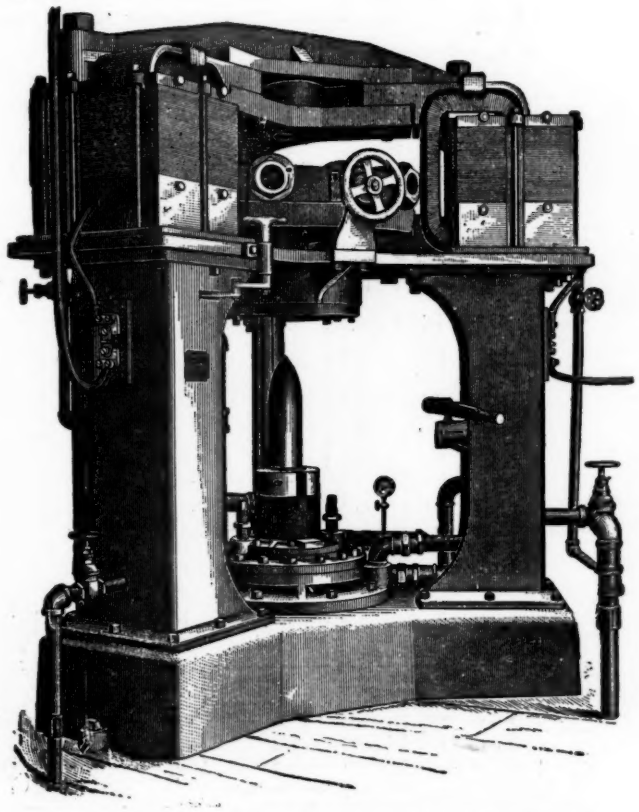


FIG. 12.—ELECTRIC WELDING MACHINE FOR LARGE PROJECTILES.

Mr. Stiness Receives His Friends.

At the opening of the new electric station of the Pawtucket, R. I., Gas Company, on Saturday, July 30, General Manager Samuel G. Stiness tendered a reception to his friends of the electrical and gas fraternity. A most enjoyable time was had.

The Association of Edison Illuminating Companies.

NEXT CONVENTION MEETS AT TORONTO, CANADA, ON AUGUST 9.

Secretary W. J. Jenks has issued the following information in reference to the next convention of the Association of Edison Illuminating Companies:

As announced in the introductory note of the secretary in the volume of minutes of the New York meeting, the next convention of the Association will be held at Toronto, Canada, on Tuesday, August 9, 1892, and will probably continue during Wednesday and possibly Thursday of that week.

The business of the Association at this meeting promises to include several features of special interest. One or more of the officers of the General Electric Company will undoubtedly be present with the view of becoming personally acquainted with the members of the Association, and of discussing, if opportunity offers, matters of general interest.

Arrangements are being made for several papers of practical importance, and reports of committees chosen at the meeting of last year.

The headquarters of the Association at Toronto will be at the Rossin House, where arrangements have been made for the entertainment of delegates at the following prices: For board and room *without* bath, $3 per day; for board and room *with* bath, $4 per day.

These rates entitle the members to the choicest accommodations in the house if engaged a reasonable time ahead, and a desirable room will be provided in the hotel for the Association meetings.

The Toronto Incandescent Electric Light Company (Frederic Nicholls, Esq., manager and secretary) has arranged an attractive programme for the entertainment of the delegates in the form of a moonlight sail on Toronto Bay, calling at Toronto Island, where refreshments will be provided for the delegates at Hanlan's Hotel, the home of the ex-champion oarsman; also a drive in carriages around the principal parts of the city.

It is probable that a trip to Peterborough, where the shops of the Canadian department are located, may be made by those in attendance at the convention who may desire to visit them. It is feasible to make such an excursion in one day, leaving Toronto at 9 A. M., arriving in Peterborough at 11.45; taking lunch at the Oriental and spending the afternoon at the works; leaving at 5.45 and arriving in Toronto at 8.10 P. M.

With these general ideas in view, it now seems probable that the programme for the convention will be substantially as follows:

TUESDAY, AUGUST 9.

First session, 11 A. M. Organization by presentation of credentials and choice of officers for the coming year. Reports of committees.

Second session, 2 P. M. Papers contributed by members and discussions.

Evening, moonlight sail.

WEDNESDAY, AUGUST 10.

Early morning, drive about Toronto.

Third session, 11 A. M. Addresses.

Fourth session, 2 P. M. Closing papers and discussions.

THURSDAY, AUGUST 11.

Entertainment of delegates by trip to Peterborough or some other point of interest.

There are within easy distance of Toronto and on the shores of the lake, a large number of summer resorts, to which passenger steamers are running constantly each day. The readiness with which the delegates may thus combine enjoyment of the coolness of a Canadian city with the business of the convention, will, it is hoped, influence a large number to attend.

The members are especially urged to prepare themselves to contribute to the interest of this meeting by bringing with them papers to be read, or some facts regarding their own business to be given to the Association, or some question to be proposed, calculated to stimulate discussion. Any member thus disposed will confer a favor upon the other members by sending to the secretary a memorandum of what he will be likely to present, and a supplementary circular may be issued within a week or 10 days of the meeting, giving an order of exercises more in detail.

It would be difficult to emphasize this request for co-operation on the part of individual members more happily than by quoting briefly from the paper of Mr. Nicholls, read at the New York meeting, "How can this Association best serve Central Station Interests?"

> "What we require to stimulate the interest and quicken the faculties of those present at a public meeting are a class of papers which deal with practical business, mechanical and electrical problems, and which any of us feel qualified to discuss, and once the ball of discussion is set rolling, it gathers strength as it rolls. As a result, a general discussion is engaged in, and men who never dreamt of getting on their feet to address a meeting, take the floor spontaneously, and, with the confidence which comes from a knowledge of the subject, refer to interesting circumstances as personally thought out or observed. What is the outcome? Good fellowship is engendered; each person present feels he has an interest in the proceedings; and more knowledge is acquired and dispensed at one session than otherwise would be the case during a whole convention."

Please consider carefully whether your company does not owe to the Association an effort to bring before this convention some original material such as Mr. Nicholls describes. If you cannot attend, you can send a paper to the secretary to be read on your behalf.

It has been the experience of more than one company that its superintendent, electrician or meter man has gained as great a tangible benefit as the higher officers who more often attend, and that an effort on the part of such a practical man to tell the story of his own experience, or read a paper, may be correspondingly productive of good to the Association as a whole.

Each member is earnestly requested to send to the secretary a memorandum of what subject will be thus presented, either as a formal paper or informally as a question for discussion, or as a matter of interest and record in the minutes of the Association. If impossible to send a delegate, please indicate what subject will be discussed or suggested in a paper or letter which may be read to the convention.

Poetry and the Trolley.

(From the New York *Commercial Advertiser*.)

The fellows who are getting up the new electric railroad scheme in the Board of Aldermen have hammered out this paraphrase of the old Elizabethan madrigal:

Sing ho! the sweet contentment
The countryman must find.
(Sing trolley-lolley la! sing trolley-lolley la!)
When crossing some electric road
The lightning strikes him blind!
(Oh! come with me and vote with me and you shall find me kind.)

Cause of the Unequal Wearing Away of Electric Light Carbons.

In an electric arc the positive pole is hotter than the negative, the positive showing a temperature of about 4,000 degrees C., the negative showing a temperature of 3,000 degrees to 3,500 degrees C. This difference of temperature produces a counter electromotive force which acts like ohmic resistance. The cause of the positive pole wearing away twice as fast as the negative is due to this difference in temperature.—*Scientific American*.

Report of the Frankfort Committee.

The report of the Testing Committee of the Frankfort Electrical Exhibition has been received by the directors of the exhibition, who have forwarded to the London *Electrical Engineer* a copy of this report, embodying the figures obtained from the tests of the transmission of power from Lauffen to Frankfort.

The work of the committee extended to three installations. The first, that of the celebrated Lauffen-Frankfort multiphase-current transmission, carried out in conjunction by the Allgemeine Company, of Berlin, and the Oerlikon Company, of Zurich, comprised the transmission of power electrically from the Wurtemburg Cement Works at Lauffen, on the Neckar, to the exhibition grounds at Frankfort. The power of the waterfall was about 300 horse-power, and the distance 175 kilometres (about 110 miles). The measurements were made by the members and assistants of the Testing Committee, composed of Professor Dietrich, Dr. Feussner, Dr. Heim, Dr. Kopp, Herr Nizzola, Herr Schmoller, Professor Stenger, Professor Teichmann, Professor Voit and Professor Weber.

The second transmission of power was installed by the Deutsche Elektricitätswerke of Aix-la-Chapelle (Garbe, Lahmeyer & Company). The power, furnished by a 20 horse-power engine in the Palmengarten, Frankfort, was transmitted to the exhibition, where it was used to drive a motor in the exhibition; the distance was about two kilometres (about one and a quarter miles), the current being high pressure continuous. The tests in this case were taken by Professor Brauer and Dr. Wirtz, members of committee, and Herren Friese, Stapelfeldt, and César, assistants.

The complete description of the tests, as well as of the methods and instruments employed, will be given in the official report, which will be published when the work of the committee upon them is finished.

Table I, given herewith, gives the results of the Lauffen-Frankfort transmission; the last column gives the total efficiency—that is, the percentage of the energy supplied to the lamps at Frankfort to the energy taken from the axle of the turbine at Lauffen.

The same tests for the second transmission plant are given in Table II, the efficiency being the comparison of the work measured at the brake on the axle of the motor and the electric energy at the terminals of the generator.

The resistance of the circuit was 5.9 ohms.

The above-mentioned tables are signed: Table I, by Prof. H. F. Weber, of Zurich; and Table II., by Dr. Wirtz, of Darmstadt.

A second committee, under the presidency of Prof. Kittler and Herr Lindly, engineer to the city of Frankfort, carried out, after the close of the exhibition, another series of measurements with the idea of determining the efficiency of the plant at voltages of 25,000 to 30,000 volts, and of examining the phenomena produced under these conditions.

The report of this committee will form part of the general report of the directors of the Frankfort Exhibition.

Table I.—Lauffen to Frankfort.

Time.	Turbine H. P. given out.	Dynamo. H.P. given out.	Dynamo. Effic'ncy.	Primary transformer. H.P. given out.	Primary transformer. Effic'ncy.	Line loss in H.P.	Secondary transformer. Energy received.	Secondary transformer. Energy given out.	Secondary transformer. Effic'ncy.	Total efficiency. Between terminals of generator and the motor.	Total efficiency. Between axle of turbine and the motor.	Weather.
	H. P.	H.P.	Per cent.	H.P.	Per cent.	H.P.	H.P.	H.P.	Per cent.	Per cent.	Per cent.	
October 11, 1.30 to 1.40	120.9	108.1	89.4	102.4	94.7	7.3	95.1	89.5	94.1	82.6	74.0	Bright, dry.
" 1.50 " 2.00	121.1	108.3	89.4	102.6	94.7	7.6	95.0	89.4	94.1	82.4	73.8	
" 12, 1.35 " 1.45	127.0	114.4	90.0	108.7	95.0	8.0	100.7	95.1	94.4	83.0	74.9	Dull, frequent rain.
" 1.50 " 2.00	127.5	114.8	90.0	109.0	95.0	8.1	100.9	95.3	94.4	82.9	74.8	
" 2.10 " 2.20	99.3	86.8	87.4	81.5	93.9	5.0	76.5	71.4	93.3	82.4	71.9	
" 13, 9.50 " 10.00	105.9	93.3	88.1	87.7	94.0	6.0	81.7	76.3	93.4	81.6	72.1	Rain till moon.
" 10.5 " 10.15	105.9	93.3	88.1	87.7	94.0	5.9	81.8	76.4	93.4	81.7	72.2	
" 14, 10.45 " 10.55	151.8	139.1	91.6	132.8	95.5	12.8	120.0	114.0	95.0	81.8	75.1	
" 11.00 " 11.10	151.7	139.0	91.6	132.7	96.1	12.5	120.2	114.2	95.0	82.0	75.8	
" 11.35 " 11.45	194.7	182.2	93.5	175.1	96.1	24.4	150.7	144.2	95.7	79.1	74.1	
" 12.30 " 12.40	197.4	184.8	93.5	177.6	96.1	25.2	152.4	145.8	95.7	78.8	73.9	Dry.
" 1.30 " 1.40	117.6	104.9	89.2	99.2	94.6	7.5	91.7	86.2	94.0	82.0	73.8	
" 1.45 " 1.55	112.7	100.1	88.8	94.5	94.4	6.9	87.6	82.2	93.8	81.9	72.9	
" 2.30 " 2.40	78.2	66.1	84.5	61.1	92.5	3.1	58.0	53.5	92.2	80.9	68.5	
" 15, 10.53 " 11.30	190.7	177.9	93.3	170.8	96.0	25.5	145.3	138.9	95.6	77.8	72.8	
" 11.5 " 11.15	190.0	177.3	93.3	170.2	96.0	24.9	145.3	138.9	95.6	78.1	73.1	Rain in early morning.
" 11.20 " 11.30	189.7	177.0	93.3	169.9	96.0	24.6	145.3	138.9	95.6	78.1	73.9	

Table II.—Palmengarten to Frankfort Exhibition, October 15, 1891.

Primary station. Generator. Volts at terminals.	Amperes.	Watts.	Revolutions per minute.	Secondary station. Motor. Volts at terminals.	Amperes received.	Watts absorbed.	Revolutions per minute.	Load on brake lever. Kilogrammes.	H. P. of motor.	Efficiency of motor. Per cent.	Total efficiency. Per cent.
1,107	13.95	15,442	511	1,045	13.95	14,578	370	15	17.44	88.10	83.10
1,124	13.90	15,624	519	1,043	13.90	14,464	375	15	17.68	89.70	83.30
977	10.55	10,307	528	932	10.55	9,832	358	5	11.87	88.80	84.70
992	10.75	10,664	526	927	10.75	9,965	361	5	11.98	88.30	82.70
1,001	10.90	10,911	527	934	10.90	10,181	364	5	12.07	87.30	81.40
970	9.70	9,408	539	899	9.70	8,720	402	0	10.52	88.70	82.10
946	9.65	9,129	538	884	9.65	8,531	392	0	10.24	88.40	82.60
941	9.65	9,081	536	896	9.65	8,646	400	0	10.46	89.10	84.80
194	1.50	291	560	175	1.50	262.50	431	Running light	—	—	—

The tide of public opinion is unmistakably turning strongly in favor of keeping the World's Fair open on Sunday, provided a "silent" Fair be assured. The Exposition authorities have never had any idea of keeping the machinery running on Sunday and everything going at full boom, as on week days, and since they have so declared themselves the demands for Sunday closing have diminished greatly in number. Not a few who had petitioned for a closed Fair have changed their minds and revoked their request and have asked that the gates be opened.

It is next to certain that the date of dedication of the World's Fair buildings will be changed from October 12 to October 21, the latter being really the 400th anniversary of the landing of Columbus, allowance being made for the correction in the calendar made in the time of Pope Gregory. The Senate has passed a bill making the change referred to, and it is not doubted that the House of Representatives will take like action. The change was requested by the World's Fair Commissioners of New York, the legislature of which State had provided for a Columbus celebration on October 12. It was thought that the two celebrations, if held simultaneously, would detract from each other.

World's Fair Notes.

The World's Fair Directory has expended up to date approximately, $7,250,000.

It is proposed to hold world's fairs in Berlin in 1898 and in Paris in 1900, but definite action has not yet been taken by the nations concerned.

The exhibit to be made at the World's Fair by Krupp, the celebrated German gun-maker, will represent an expenditure of $1,500,000. The largest cannon ever made, weighing 122 tons, will be in the exhibit, as will be also several hundred tons of war material.

Foreign governments participating in the World's Fair have been requested to furnish, before September 1, the plans of the buildings, if any, which they propose to erect at the Exposition. It is not the intention to reserve space for buildings for them beyond that date unless there should be special reasons for doing so.

A New Boston Company.

The Van Choate Electric Car and Light Company has taken offices Nos. 315 and 316A Exchange Building, Boston. The company has a capital of $6,000,000, is organized under the laws of Maine, and proposes to do a general electric business in the manufacture of an improved dynamo and lamp for lighting and a new system for street railways. The patents of the company are said to cover devices radically different from any electric lighting system now in use. The company is negotiating for a factory. C. Henry Kimball is president of the company, and S. F. Van Choate is the electrical engineer.

Lighting Docks by Electricity.

The question of lighting the Leith Docks by electricity was before the Dock Commission at their last meeting. From a report presented by the superintendent, it appears that the cost of the installation will be about £10,000. This would involve an annual payment, including a sum for depreciation, of £2,300. The desirability of lighting docks by electricity is now generally admitted, and it is to be hoped that the works committee, to whom the project has been referred, will see their way to report favorably upon the adoption of the system, although I understand they do not at present feel disposed to undertake the work.—*London Transport.*

Amateur Telegraphers.

It would be interesting to see some statistics of the little amateur telegraph organizations now in operation all over the country, says the New York *Evening Post.* No one knows how many of these there are, but it is said that nearly every State has several. Out in the village of Cranford, N. J., are a couple proposing to consolidate, after the manner of all telegraphs. If they do, they will have no fewer than 20 stations and a total of 3½ miles of circuit. The lines are governed by an executive committee, which gets the supplies and transacts routine business, and there is a complete code of fire, burglar and emergency signals. Evidently the young people, with a little training, could make such a service of great convenience in our straggling villages and suburbs; and by and by, when the telephone is common property, it is not too much to expect that these amateur bodies will increase rapidly in number and usefulness. The same idea carried out in farming regions would go far to overcome the monotony and isolation of farm life, and to offset the drawbacks of bad roads. The expense of an outfit is trivial.

The Cuttriss Carbon Relay.

The relay for submarine cables designed by Mr. Charles Cuttriss is most ingenious, and we venture to predict for it a wide use. The present system of manual re-transmission has long been set down as clumsy, expensive and inaccurate, for it is at intermediate stations that errors in receiving and sending are most likely to creep in, but the many difficulties in the way of mechanical re-transmission have forced telegraphists to the continued use of the old system, with all its faults, and in all its clumsiness. It is easy enough to design, on paper, a perfect relay for recorder work; a couple of contact points fastened to the recorder coil and a corresponding set of fixed contacts on the frame of the instrument constitute all that is required—theoretically. When we remember, however, the minuteness of the currents with which we have to work, and the consequent delicacy in the apparatus, we begin to appreciate how small are the forces which we have at command to press the contacts home. Although the steady current may be but a small fraction of an ampere, there will be, at starting, a small insidious arc, which will weld together the contact points of our ideal relay in a most provoking and aggravating manner. This sparking, it is true, can be reduced by a judicious shunt or a subtle condenser, but experience shows that these do not entirely eliminate "stixion" at the contact surfaces. Nor is stixion the only grievance, for, even supposing it were overcome, there remain all the difficulties of a shifting zero, an earth current, or a variation in the fibres or siphon necessitates a new adjustment of affairs all round, and this by an impatient and perhaps incompetent manipulator. The device of using a change of resistance in the relay circuit instead of an abrupt break, and the combination with it of a differential system for magnifying this change, is the essential principle of the invention of Mr. Cuttriss. His article does not state the actual resistance of the carbon springs, nor the change in the resistance which results from an extension of the springs when the recorder coil actuates them; we should be glad to know what values are practically used. Although this relay would seem to require very careful adjustment when first installed, there does not appear to be much that can get out of order when it is once under way. There is an increasing demand for a good cable relay, and this device of Mr. Cuttriss comes as near to a workable instrument as anything we have yet had described.—*London Electrical Review.*

A Thief Caught by Electricity.

A few years ago Dr. Livingstone, one or two others and myself were camping in Lake County. We had a canned plum pudding which we prized very highly and a stable boy who was not bad in his way. Just as we reached Saratoga Springs the plum pudding disappeared, and we rather suspected the stable boy, but suspicion wouldn't tickle our palates or fill our stomachs.

In our outfit was an electric battery, and I determined to try it as a thief catcher and mechanical detective. I herded all the cooks, scullions and waiters about the place and stood them in a row with the stable boy. Then I made them a little speech, telling of the theft of the plum pudding, and asking the guilty one to confess. No one peeped, and the most innocent appearing person in the company was the suspected stable boy.

"Very well," I said, sternly. "We have here an instrument which detects thieves as surely as a camera takes photographs. The innocent it will in no way affect, but it will cause the guilty to suffer excruciating pangs—in limbs and conscience. Doctor, apply the test."

With this Livingstone stepped out with the battery. Placing the handles of the apparatus in the hands of the first man in the row, the doctor looked him in the eye a moment, but didn't connect the electricity. Of course, the man was not affected, and was declared innocent.

So the doctor passed from man to man until he came to the stable boy. As soon as the lad gripped the handles Livingstone pulled the machine wide open. That night we feasted on our recovered plum pudding. —*San Francisco Examiner.*

The American Type Telegraph.

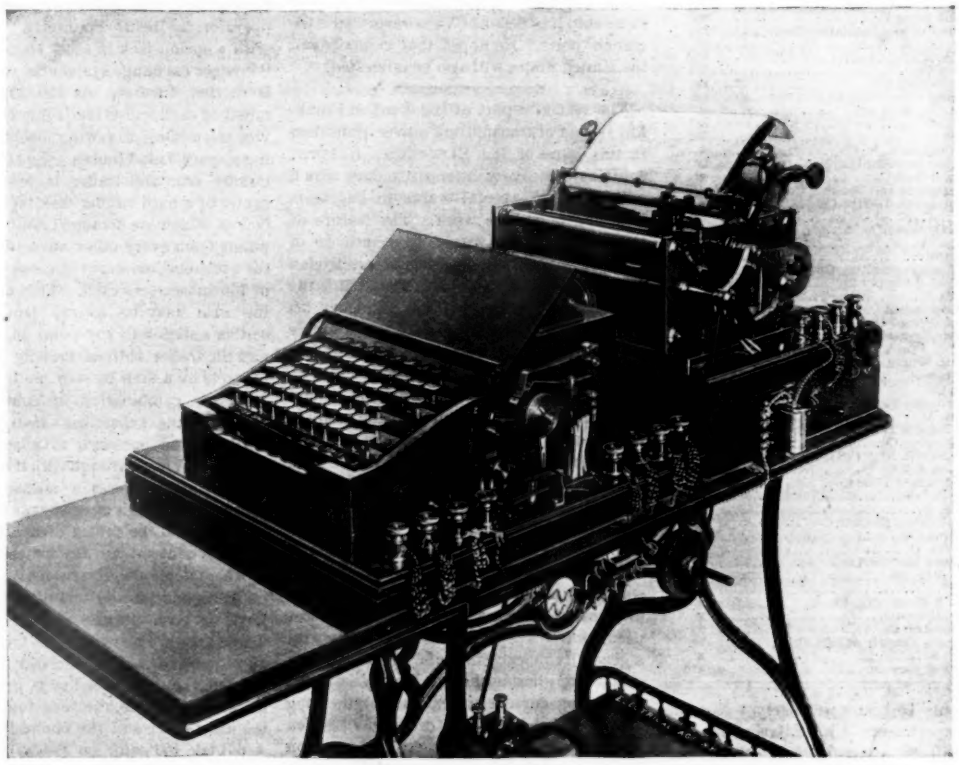
Printing telegraphs are almost as old as the electric telegraph itself. House, Hughes, Phelps and others followed quickly in the footsteps of Morse, with devices for supplanting the Morse character with the Roman letter.

In some countries they almost succeeded, and to this day continental Europe does a large amount of its telegraphing by means of the Hughes printing telegraph.

In England the Hughes machine was extensively employed by the old companies, and was only abandoned after the telegraph had been absorbed by the government.

In this country there was once a "House" telegraph line using that system exclusively, and the Western Union Company has for years transmitted press and other telegrams between Boston, New York, Philadelphia, Baltimore and Washington, by means of the Phelps improved "motor printer," with success, and at a rate of speed far exceeding that of the Morse.

One of the chief objections to the printing telegraphs in the past has been the "form of delivery." All of them printed their messages on a narrow band of paper or "tape." A press dispatch of a few hundred words would be many feet in length and liable to kinks, breaks and entanglement.



THE AMERICAN TYPE TELEGRAPH.

Users of the telegraph have always objected to receiving their despatches on a ribbon, and many have refused to accept them by the yard, asserting that filing with safety was impossible, and that portions of messages were frequently lost. As a result, all despatches received by printing telegraph in Europe are now torn into short lengths and clumsily pasted on ordinary delivery blanks.

The tearing and fouling of the tape in the basket of the ordinary "ticker" is familiar to all, often rendering impossible a backward search for some particular item of news.

The American type telegraph machine has been designed with a view to overcoming this and many other objections to printing telegraphs as they have heretofore existed. By means of this latest device, the delivery is in the form of a printed page, eight inches wide. All the letters, numerals, fractions and other signs necessary to ordinary typewriting are provided.

The receiving instrument is entirely automatic in its action, requiring no skilled operator to watch or adjust it. The transmitter is similar in form to the typewriter, as far as the arrangement of the keys is concerned, and can be worked by any person familiar with that instrument. The transmitting operator, by means of his keyboard, has full control of the machine at the distant end of the line, and can vary the length of a printed line or the space between the two items of news or two telegrams at will.

Electrically, this instrument has been designed with the object of relieving the electro-magnets which are operated or connected with the main line of as much work as possible. This object is accomplished by the use of a suitable motive power (a small electric motor), independent of the magnets, for effecting the mechanical operation of the several parts of the printing and feed mechanisms and by utilizing the electro-magnets merely for releasing, arresting and generally for controlling the action of the said motive power.

The type-wheel employed has four rows of characters, and is combined with means for raising or lowering the same for the proper alignment of any one of the rows. An oscillating movement is also given to the type-wheel, whereby any desired character is printed on the paper. Mechanism is provided for rotating the type wheel to present any desired character of a given row to the paper in the printing position; also for moving the type-wheel and its carriage laterally across the face of the paper and for its return to the starting or initial point, also for feeding the paper upward at the end of each printed line.

Mechanisms, all actuated by the above-mentioned motor, also set the type-wheel, make the printed impressions, control the letter feed and spacing, return the type-wheel carriage and feed the paper. The first, second, third and fourth positions of the type-wheel, presenting the various rows of characters to be printed, are obtained by the action of the motor, as well as the restoration of the wheel from the fourth to its original or first position.

The setting mechanism which governs all of the above movements is a small, light shaft, actuated frictionally by the motor and released, step by step, by a sensitive polarized relay in the main line circuit. Here inertia is small, and a consequent high speed of revolution obtained—400 or more revolutions per minute.

On this shaft are an escapement wheel, ratchet retaining wheel, unison device and a setting pin and wedge. The moment the pin is placed in the proper position by the action of rapidly reversed currents, other magnets in the circuit, neutral and less sensitive, are affected by the prolongation of the current and release the mechanisms connected with the motor necessary to perform the various functions already enumerated.

The work done by these magnets, which are in the main line circuit (there are three of them), is of the lightest character possible, and the working of the instrument over long circuits, where light currents are necessarily employed, is practically assured. In practice, a speed of over 40 words per minute on a 200 mile circuit, using the ordinary Morse power, has been reached, and will probably be exceeded when operators shall have become entirely familiar with the working of the machine.

Typewriting by wire and by ordinary typewriting methods have been the objects sought to be obtained in the American type telegraph. The width of the paper, the form and action of the keyboard, as well as the manipulation of the machine generally, are made to conform, as nearly as possible, to the practice with which an ordinary typewriting operator is familiar. But all these qualities, were they not accompanied by the prime adjunct of a good commercial speed, would be insufficient. A new device, to be commercially successful, must maintain or increase the carrying capacity of a wire, and this the American type telegraph does.

The accompanying illustration shows the machine which has been referred to above. The company is, however, manufacturing another and smaller machine, which also works at a good speed and delivers its matter in the same form, for private line working. In this latter device the motor is eliminated and the construction is generally simpler.

A column or page-printing machine by the same inventor has been working successfully in London for the past three years, delivering news reports to all the leading newspapers and clubs.

The instruments owned by The American Type Telegraph Company, comprise the London machine as well as the two others referred to above. The success of the London machine may be taken as some indication of the capacity of the two latest machines which have not only been improved in every detail, but in principle also; the speed of motor machine being more than double that of the English one.

The inventor of these instruments, including the London one, is Mr. J. E. Wright, of New York.

ELECTRICAL PEOPLE WE MEET.

Mr. Fred. Swift, for a number of years actively connected with electrical interests in Boston, having been associated with President Fred. A. Gilbert, of the Boston Electric Company, and with the Sun Electric Company (Slattery system), of Woburn, Mass., has established himself in the metropolis with Mr. Wendell Goodwin as partner. The firm of Goodwin & Swift is recognized in financial circles as possessing a gilt-edged credit, both being gentlemen of means and sagacity. The handling of electrical bonds and other high class electrical securities are made a specialty by this firm, and they have recently been active in organizing several electrical railways. Mr. Swift has many interests, and was at one time largely interested in the whaling industry, which was so prominent a feature several years ago of the business of New Bedford, Mass., where Mr. Swift hails from. His many former friends will be glad to welcome him in the electrical field again, where his energy, ability and geniality make him a pronounced force in the general advancement of electrical interests.

Mr. R. B. Corey, general manager of The Electric Construction and Supply Company, of this city, makers of the "Ward" arc lamp, has hundreds of friends in the electrical field. Mr. Corey has an imposing presence and a genial, though business-like, address. For several years he was associated with his father in the banking business. During the oil excitement at Bradford, Pa., Mr. Corey was one of the most active operators on the Exchange. Here he met C. R. Huntley, of Buffalo, who was also an oil broker. The politics of the Empire State, as evidenced at Elmira, Buffalo and New York city, are familiar to Mr. Corey. A few years ago he took up the company of which he is now the general manager, and transformed it into one of the most successful and best paying businesses of the electrical industry.

Although Hollon C. Spaulding has recently left the electrical ranks, his interest in the business is as great as ever. He will be remembered for many years as one of the pioneers on the commercial side of electrical power development. His connection with the Thomson-Houston interests was profitable both to the company and himself. Mr. Spaulding is now the general manager of the John A. White Company, of Dover, N. H., manufacturers of wood-working machinery. He has a beautiful residence at Exeter, N. H., 17 miles from Dover, where he is constructing a laboratory for special researches in electricity. Mr. Spaulding has recently perfected an extremely novel electrical generator, which will be illustrated and described in the ELECTRICAL REVIEW at an early day. He was recently in New York, and gave striking evidence of not having lost the effects of his early electrical training. He asserted that the hogs in Exeter are fed exclusively on cream and corn, making the pork of that locality as juicy and tender as chicken meat. Notwithstanding this epicurean characteristic, Exeter is the largest town in New Hampshire without an electric light plant.

Captain E. L. Zalinski, U. S. A., is enjoying a sick leave visit in the East with headquarters at the Electric Club. Some eight months ago the Captain suffered a paralytic stroke which for a long time deprived him of the use of his left arm and leg and also affected his tongue, so that it was difficult to speak clearly. Treatment and care have greatly improved the Captain's condition, and he is now gaining strength, although still compelled to walk with a cane. In a recent interview Captain Zalinski stated that the most poignant grief he felt at the time of his affliction was the fact that it occurred when it looked as if we were to have a passage at arms with Chili. It was very natural for the inventor of the dynamite gun to desire to be at the front at that time.

BI-POLAR.

ELECTRICAL REVIEW

Published at 13 Park Row,
P. O. Box 3329. NEW YORK.

EDITOR:
CHARLES W. PRICE.

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STEPHEN L. COLES.
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REGISTERED CABLE ADDRESS:
ELECTVIEW," NEW YORK.

"1546 CORTLANDT." TELEPHONE CALL.

BOSTON OFFICE:
W. I. BARKER, Room 29, 620 Atlantic Ave.

WASHINGTON OFFICE:
GEO. C. MAYNARD, 1409 New York Ave.

CHICAGO OFFICE:
MERWIN J. BULKLEY, 435 "The Rookery."

EUROPEAN OFFICE:
JOSEPH FFRENCH, Editor for Europe.
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Northumberland Ave., Charing Cross, London, W. C.

Cable Address: - - "Electview," London.
Telegraphic Address: Ffrench, "Victoriola," London.

ADVERTISING DEPARTMENT,
H. T. RICHARDS, Manager.

PATENT BUREAU,
ROBT. H. READ, Manager.
Patents procured in United States and all foreign countries. Searches, Investigations and Reports on Validity and Infringement.

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One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy, - - - - - - - .10

ANNOUNCEMENT.

Address all communications and make all money orders and checks payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

No attention will be paid to communications for the REVIEW without the *name and address of the writer.*

NEW YORK, AUG. 6, 1892.

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The success of the trolley system as a rapid transit carrier has been demonstrated. As a dividend earner its success depends upon the way it is managed. Indeed, this is true of all electrical enterprises.

An instructive article on the manufacture of electric welded projectiles appears in this issue. This is a comparatively new industry, but its present prominence emphasizes the important part electricity plays in preparations for war, and indicates the extent of the future development of this particular branch.

Cable construction is at present undergoing a mild boom. A practical route from California to Honolulu has been located, and now a new Australian cable is being agitated. A cable dispatch from London, under date of July 28, announces that Premier Dibbs, of New South Wales, left London on the date named on his journey homeward. He will spend a few days in New York and go thence to Montreal and Ottawa. His object in visiting Canada is to sound prominent capitalists in the Dominion in regard to the plan of laying new cables between England and Canada, and the laying of a line between Vancouver and Australia, and also the establishment of a new steamship line between Vancouver and Australian ports. He hopes that capitalists in the United States will also be interested.

The official report of the Lauffen-Frankfort system of transmitting power, published in this issue of the ELECTRICAL REVIEW, contains some very interesting data which will prove of special value to engineers handling polyphase work. The feature of the report, which would have proven of greatest interest to the general electrician has, however, been omitted, and that is the efficiency of the motor. The efficiency between the turbine axle, which is the source of power, and *the motor* varies between 68.5 and 75.3 per cent. What the motor efficiency of conversion is, or what the general efficiency between the turbine axle and the motor axle, or, in other words, between source of power and power delivered, is not stated. If the motor efficiency were not over 80 per cent., the general efficiency would be between 55 and 60 per cent., showing that about 40 per cent. of the energy is lost in overcoming purely electrical obstacles. In the continuous current system of transmission, in which high pressure was used, power was transmitted 1¼ miles with a general efficiency of from 81.4 to 84.8 per cent. Considering that the line losses in the alternating current system used on the long circuit between Frankfort and Lauffen were only about seven per cent., the station apparatus of the alternating system seems to fall far below the direct system in efficiency.

Dr. Louis Duncan's scholarly "Note on Some Experiments With Alternating Currents" will be appreciated by those who were interested in his work in the same line last Autumn. The same methods of obtaining alternating current curves were used in both sets of experiments and their success has been perfectly demonstrated.

The first convention of the Association of Edison Illuminating Companies to be held since the formation of the General Electric Company will take place at Toronto, August 9. Officials of the General Electric Company will be present to meet and address the Edison men. These meetings have been productive of much good in the past and it would seem desirable that they be continued.

It has been suggested that investigation be made as to whether or not insanity and nervous diseases are more prevalent during periods of great magnetic disturbances than at other times. During the sun-spot maximum beginning in 1883, cases of sudden insanity seemed to be very prevalent. At the present time, which is one of intense magnetic unrest, a large number of cases of sudden insanity are reported. Many people have experienced that peculiar sensation in the head which is a warning of an approaching thunder-storm. Although this is a merely temporary sensation, yet it seems possible that if carried to an extreme it might result in what has been called heliocy. A field for investigation is here apparent.

MESSENGER BOYS FOR SOLDIERS.

The London *Morning Leader* has exposed a novel scheme of the British government to secure recruits for the army. In view of the reluctance of desirable young men to volunteer for the service, an order has been issued requiring all boys who apply for the place of telegraph messengers to agree to join the army at the expiration of their term in the messenger service. The paper calls attention to the immense importation of boys to the ranks of the army, and the increasing difficulty of obtaining recruits owing to the smallness of the pay, the poor chance of promotion for those without influential friends, and the chilling manner in which the soldiers are treated where they ought to be welcome.

The London *Leader* also condemns the government for thus taking advantage of 13-year old boys by compelling them, as a condition of employment, to bind themselves to service for which they have no desire, and by inveigling many of them into signing articles of the real meaning of which, so far as the promise of army service is concerned, they are probably ignorant.

The English type of messenger boy must be very different from the American variety. An American messenger boy could never, under any circumstances, acquire a correct understanding of the military order: "Double quick! March!"

THE STROWGER AUTOMATIC TELEPHONE EXCHANGE.

The Strowger Automatic Telephone Exchange Company, an Illinois corporation, of which M. A. Meyer is president, J. Harris secretary, J. H. Theobald manager of the New York office, and A. E. Keith electrician, has opened offices at 458 Broadway, this city. If all claims are realized this system will soon cause the telephone girl, with her many virtues and some failings, to become a thing of the past. That vague and vivacious entity, popularly known as "central," will be displaced by a cold and inanimate combination of copper, wire, brass and iron. The now bustling and busy exchange will become a silent and desolate hall, and the unfailing accuracy of ratchets, cogs, pawls and pivots will be the order of the day. Being in line with the recent evolution of human conveniences, this is also a "press the button" system, and if the little device at the exchange will "do the rest" the millennium of the discontented telephone subscriber is near at hand. The Strowger system is founded upon that of the well-known multiple switchboard now used in telephone exchanges, wherein every line entering the exchange is brought to the surface of the board, within easy reach of each operator, by being connected in multiple with a spring-jack in each section. In the Strowger exchange system the multiple idea is carried further. At the exchange terminal of each subscriber's line is a small device resembling a sewing machine, occupying a space 4x4x6 inches. To this a circuit closing arm and trailer is pivoted at the center of a hard rubber disk, upon the surface of which are arranged multiple contact points from every other subscriber's line in the exchange, arranged in concentric circles of 100 subscribers each. This contact closing arm may be moved from the subscriber's station to any point in any circle, and the trailer shifted radially from circle to circle by a step-by-step motion, resulting from the combination of connecting keys placed on the subscriber's instrument, with a battery and polarized magnets at the exchange. When through with the connection the subscriber presses a release key, which restores the circuit closing arm to a normal zero point on the rubber disk. This system does not contemplate any material alteration of the telephone instruments at present used, beyond the addition of the four or five keys or push buttons above mentioned. These keys are marked units, tens, hundreds and thousands. If subscriber No. 2142 is wanted, the thousands key is pressed twice, the hundreds once, the tens four times, and the units twice and the connection is made. A tell-tale indicator on the subscriber's instrument will show him whether this combination has been properly worked out at the exchange, whereupon he will ring the magneto bell in the ordinary way. If it does not ring he knows that the desired subscriber is busy, although the bell of that subscriber does ring, and he, by pressing the release key, may leave his present connection for a moment, if he chooses, to ask the party calling to wait a minute while he returns to finish with the first party. In this way a subscriber is never out of reach, because his bell will always ring, no matter whether his line is already in use or not. The system provides for the operation of a single exchange only in each city, trunking between several exchanges making further additions to a complication already great. Another limitation is the necessity of running a double or triple line to each subscriber. A single wire can be used, but is impracticable, because it involves the placing of the connecting and disconnecting battery at the subscriber's station instead of at the exchange.

Doubtless, there is in the Strowger system a suggestion of the ideal telephone exchange, but the good natured and nimble fingered maids who now preside at the "multiple" need have no fear of being supplanted by this automatic girl for some time to come.

Just about now should be a good time to purchase bargains in electrical apparatus for winter use.

CORRESPONDENCE.

OUR BOSTON LETTER.

The Narragansett Electric Light and Power Company, of Providence, R. I., recently introduced in its station four 5,000 light generators of the Ferranti type.

An Attractive Display of incandescent lights is made every evening (excepting Sundays) at the new store of the Vishnu Springs Company, No. 162 Tremont street, this city.

Reorganization of the North Attleboro, Mass., Steam and Electric Company occurred on July 26, as follows: President, H. M. Doggett, Jr.; treasurer, W. M. Otis; clerk, C. T. Guild.

The Yuma Water Power and Light Company was organized recently at Saco, Maine, for the purpose of manufacturing machinery for water power, electric lighting, etc. Capital, $100,000.

The Bryant Electric Company, Bridgeport, Conn., the widely known manufacturers of the popular Bryant Switches, has established a branch office at No. 1522 Monadnock building, Chicago.

The Consolidated Electric Manufacturing Company, this city, has closed its branch offices and salesrooms at the corner of Franklin and Congress streets, and fitted up new offices at its factory Nos. 353 and 355 Congress street.

Mr. George D. Haynes, a well known and practical engineer of this city, has resigned his position as superintendent of the Suburban Light and Power Company. Mr. Haynes has been identified with various electrical enterprises in this section during the past 10 years.

Consolidation has taken place between the Suburban Light and Power Company and the Walworth Light and Power Company, both of this city. Mr. H. W. Turner, heretofore the manager of the latter company, will be the general manager of the consolidated organization.

The Western Union Telegraph Company now has nearly $15,000,000 surplus. As the stockholders are entitled to it, an attempt will be made this year to have this sum distributed. It is intimated that negotiations have progressed favorably for closing a lease with another company.

Portland, Me.—On July 26 the New York Electric Incandescent Lamp Company was organized for the purpose of manufacturing electric lamps and other electrical apparatus. Capital, $2,000,000. Officers: President, G. H. Ford, of Waterfield, Conn.; treasurer, G. R. Stone, of New Haven, Conn.

The Laminar Fibre Goods Company, Boston, Mass., reports its product as thoroughly homogeneous and practically indestructible and is a substitute for hard rubber for insulating and mechanical purposes. It can be turned or drilled into any desired shape and is capable of taking a high polish.

Increase of Capital.—The railroad commissioners of Massachusetts gave a hearing this morning on the petition of the Haverhill and Groveland Street Railway Company for an increase of capital of $275,000. Their capital stock at the present time is $144,000. The increase is asked for so that the road may be equipped with electricity and new rolling stock.

Messrs. Locke Bros., Salem, Mass., have just brought out the largest steam pressure regulator ever made. The valve is four feet long and weighs almost an even ton. The regulator is practically two machines in one, as it not only controls the pressure but also the supply of steam, and is automatic in its action. This was made for a special purpose, and the next largest regulator is in the capital at Washington.

A Remarkable Record.—A prominent mechanical engineer of this city while in conversation recently with the superintendent of engine room of the E. P. Carpenter Company, Brattleboro, Vermont, was informed: "We have been running an 80 horse-power Harris-Corliss engine for a period of nine years—every working day in the year—without repairs of any kind, and to all appearances the engine is in as good condition to-day as when it was first installed."

Repairs on the West End Electric Railway.—To facilitate better service on the electric railway in this city the old rails are being rapidly replaced with the latest improved Johnson rail. It may interest stockholders of the Thomson Electric Welding Company, and perhaps others, to learn that the feet upon the rails being laid in Washington street by the West End Railway Company are welded to the rail by electric process. This does away with the chairs ordinarily used in laying rails. The rails were made at Johnstown, Pa., where five machines are running night and day upon this work.

Boston, July 30. W. I. B.

Mr. C. O. Baker, Jr., the platinum importer and refiner, left the first of this week on a Western trip accompanied by Mrs. Baker, and will stop several days in the World's Fair city, with headquarters at the Wellington Hotel. Mr. and Mrs. Baker will remain West about three weeks.

OUR LONDON LETTER.

The Recent Defunct Parliament, formally dissolved on the 28th ult., just before its demise, gave legal sanction to the construction of electric railways to run through, or rather under, London. The first (The Central London Railway) from the city to Bayswater, acquired mostly by men of business residing in that and the neighboring suburbs, and proceeding daily to their offices or stores in the city. The other (The Great Northern and City Railway) from Drayton Park to Finsbury Pavement, and being of exceptional interest, as intended to relieve the Great Northern traffic, and over which it is proposed to run the ordinary rolling stock of the Great Northern Railway. This is, in its way, the most important event that has occurred here since my last communication. Six such bills were submitted to the Parliament, and the conjestion of traffic which they were designed to remedy, each in its own locality, were and are obvious and grievous; yet only two bills were, with difficulty passed—another illustration of the clumsy working of our legislative machinery.

The advantage, however, to be expected from even this partial gain, is simply incalculable; but we may form an approximate estimate from our experience of the City and South London Electric Railway; the only specimen of such work existing amongst us. That line, starting from a terminal station adjoining the Monument, and remaining under the Thames, the Borough, Covington and Kennington, to Stockwell, with three or four stations on the route, was opened for public traffic at the end of December, 1890. For the first half year the number of passengers carried was 2,412,343; for the second half year the number of passengers carried was 2,749,055 exclusive of season ticket holders, the revenue from which class, on an average, would represent 37,300 additional passengers, or a total of 2,786,355. It may, therefore, be assumed that, before long, the other projected lines will be taken up, and this convenient and popular system of transport will be generally extended, so as to relieve the great and growing traffic of this busy metropolis.

The Turmoil of the general election seemed to disturb the social world somewhat as a thunder-storm affects the physical world. The normally quiet man of business becomes for the time an agitator, and even the principles to which we generally look for guidance appear to be strangely deflected. Thank Providence, all that is now over, and we already begin to taste the sweetness of the calm that proverbially succeeds the storm. Every class had its share of the commotion, and among them even the votaries of electric science have not come off scathless. Not only were the telegraphists busy all day, reporting in every direction the incidents of the contest, but some of our most respectable firms have been actively engaged in stimulating the excitement. From the lofty tower of the National Liberal Club and other commanding points, from the façades of other clubs, the various committee rooms and the offices of the leading daily papers, electrical devices have, evening after evening, flashed to eager crowds the result of each poll as the news arrived. At one time tongues of flame flared for the triumph of some popular favorite; in other places the hero's name was shown in letters of light; while in others still, pictorial designs, representing persons or scenes, elicited the cheers or the groans of the mixed and many-sided mob.

The Electrical Exhibition at the Crystal Palace is over, and the awards have been made. When the jurors were appointed I furnished you with their names. They were all, without exception, gentlemen of position, socially and scientifically, and no sane man would think of disputing their decision. The highest award (the diploma of honor and gold medal) was granted to the Brush Electrical Engineering Co., the Edison & Swan Electric Light Co., Crompton & Co., Johnson & Phillips and Siemens Bros. & Co. The diploma of honor was granted to H. M. Post Office, the London, Brighton & South Coast Railway Co., the London, Chatham & Dover Railway Co., the London & Northwestern Railway Co., the National Telephone Co., the Exchange Telegraph Co., Crossley & Bros., Swinburne, J., & Co., and Williams & Robinson. Gold medals were given to Coxeter & Son, Davey, Paxman & Co., Easton & Anderson, the Electric Construction Corporation, the Electrical Power Storage Co., Glover, W. T., & Co., Henley's, W. T., Telegraphic Works Co., Laing, Wharton & Down Construction Syndicate, Walder Bros. & Co., Saxby & Farmer and White, J.

Long lists follows of those who received medals of silver or bronze, and it is, in the highest degree, creditable to the whole profession that so very large a number of its members have distinguished themselves, and, either by inventive ingenuity or constructive excellence, won the approbation of so eminent and so critical a tribunal.

London, July 23. JOSEPH FRENCH.

Electric Light Wiring and Insurance.

A LETTER FROM MR. H. WARD LEONARD ANSWERING THE INQUIRIES OF MR. EVANS PUBLISHED IN THE "REVIEW," JULY 16.

TO THE EDITOR OF ELECTRICAL REVIEW:

1. I think the large portion of the old wiring, that is wiring done more than four years ago, and done more recently by those not entirely familiar with the requirements and best practice, is unsafe and likely to cause fire.

2. Buildings can be so wired as to be perfectly safe, from the standpoint of the Fire Underwriters, by the use of high grade rubber covered wire, so placed as to be protected from materials which will have a deleterious effect upon the insulation.

3. The tubing should be of some material mechanically strong and which is a fair insulator of electricity. It is not, however, necessary that the tube should be a high insulator of electricity, and since it is difficult to secure insulating materials which are tough, strong and lasting, it is better to have first-class mechanical qualities with fair insulation, rather than high insulation with poor mechanical qualities. In other words, the tubing should preserve a permanent, reliable duct in the wall, but high grade wire should be used in this tube under all circumstances. In the case of the circuits which are run below the plastering and which ordinarily carry less than five amperes, it is best to place two conductors close together in a single tube, as under such conditions, if any original defects exist in the wire, it would rapidly and safely blow the safety fuse on that circuit, instead of causing an electrolysis which will gradually make a very dangerous arc and fire without blowing the fuse, as would be the case if single wires were used in tubes separated from each other. Furthermore, should single wires be in a single tube any break down of any nature must necessarily be between the two wires and inside of the tubes, so that the duct is not permanently injured, and the old conductors can be readily pulled out and new ones put in; whereas, if a single wire be placed in a single tube and for any reason a defect should occur, the wall of the tubing itself being in the path of the current, would be destroyed and it would be very much more difficult to rectify the trouble.

From the standpoint of the Fire Underwriters, I consider it of the utmost importance that the two wires of the tap circuit be placed in a single tube, and under such conditions I think the fire risk would be reduced to a minimum.

In the case of a three wire tap circuit the same argument applies to the use of three conductors inside of a single tube.

Yours very truly,
H. WARD LEONARD.

Siemens & Halske in Chicago.

Siemens & Halske, the wealthy German firm of electricians, have commenced work on their American plant at Chicago. The stone foundations are set and the brick work of the buildings has been commenced. The site alone is said to have cost over $200,000.

During a recent electric storm, Aaron Hanna, of Saugerties, N. Y., was killed by electricity in the Saugerties electric light plant, of which he was proprietor. He was in the dynamo room, and had just set one of the dynamos running, when a bolt of lightning entered the window at which he was standing and killed him instantly.

An electric light wire which crossed the Bowery at Fourth street, New York, stretched on high poles, parted one morning last week and fell across the up-town track of the elevated road. A train came along and the heavy wires were caught by the wheels of the locomotive and whirled around at a smart pace. Samuel Platzman, who was crossing the Bowery at the time, was caught in the whirling wire and thrown to the ground. He received a lacerated wound of the left arm. Before any further damage was done the train was stopped.

Letters from a Laboratory.—VI.

BY JULIAN A. MOSES

It is said that cleanliness is next to godliness, but I am inclined to think that in a laboratory we can safely reverse the order, making it the exception to prove the rule.

I know a man who will never allow anyone to go into his workshop when it is in the least disorder, and I had to wait a little while the other day before he would admit me. But when I entered the general air of neatness that prevailed made me feel that I was in the laboratory of one who could produce excellent work. It was not at all difficult to discover the "secret" of his uniformly excellent results. The man was mirrored in his work. His conversation was clear-cut, orderly and grammatical, and, although his hands were covered with plaster, his linen was immaculate.

Above all, be orderly; you never can expect to achieve any success if you spend half your time in looking for things that would be instantly at hand, were they in their appointed places.

Be neat. If you are fortunate enough to possess the bump of locality, don't spoil all by keeping your tools and instruments in such a condition that, even if they are handy, they may not be fit to use.

In a laboratory, order relates to the relative locations of objects; neatness and cleanliness concern the conditions of the bodies in it. "Dirt is but a matter of place," and this letter will treat only of the means for removing this superfluous matter from different objects.

There are a few fundamental points to be learned in the art of cleansing.

Those things that soil objects may be divided into two classes; foreign materials, and those things that are the result of some chemical action, such as oxidation, which remain on the surface of the object.

There are two ways of removing such coatings, by mechanical means, such as friction, and by chemical means. Remember that acids neutralize alkalis, and *vice versa*. All acid stains on wood, clothing, etc., should be immediately removed by rubbing with a woolen rag or a piece of absorbent cotton dipped in ammonia, a bottle of which should be kept handy for such emergencies. The application of chloroform to the spot will generally restore the stained part to its original color. Alkali stains should be washed with a dilute solution of acetic acid.

To remove refractory substances from a glass vessel, wash first with water, rinse it out and pour in a solution of aqua regia (nitric acid two parts, hydrochloric acid one part). Allow this to touch every part of the vessel by slowly turning it around, keeping the hands wet with water in order to prevent staining the skin. Pour it out, wash well with water, and if it is required to dry the vessel quickly, pour into it some alcohol, shake it arouud, pour out and blow air through a glass tube connected with a bellows into the vessel; if a bellows are not handy, draw the air through the tube into the mouth. Do not attempt to blow with the mouth through the tube, as the moisture from the breath will prevent the evaporation of the alcohol and, perhaps, deposit on the sides of the glass, thus defeating your purpose. Keep such vessels as have been cleansed ready for use by covering them with paper caps or discs. If vessels in the hurry of an experiment are laid aside before cleaning them, fill them with water and let them lay some time in the sink, so that whatever salts may tend to stick to them will be dissolved or softened by the water thus kept in them for a few hours.

No matter how superficial an experiment may be, it may at some time be of the utmost importance and may possess a decided market value. It is, therefore, necessary to keep a correct record of all experiments. Let them be neat and orderly, and make your drawings as perfect as possible. Keep your records in ink, as pencil marks are always liable to be erased. In the hurry of an experiment you may, provided you are not careful, make a mistake, or, perhaps, a blot. Erasing takes time, and when the blot is removed the paper always presents an unsightly appearance. This untidyness may be avoided as follows:

To remove ink stains from books, papers, etc., moisten the spot with a solution of hypochlorite of sodium, into which has been recently put one or two drops of sulphuric acid. The sulphuric acid thus added liberates some chlorine, which, uniting with the iron in the ink, makes a soluble, colorless chloride of iron. This should be washed out with water, and the ink stain will be found to have disappeared.

Note on Some Experiments with Alternating Currents.

READ AT THE GENERAL MEETING OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, CHICAGO, ILL., JUNE 6, 1892, BY DR. LOUIS DUNCAN, ASSISTED BY MR. E. R CARICHOFF AND MESSRS. R. H. AND G. E. HUTTON.

I must apologize for the brevity and scope of this paper, not because I sympathize with long papers, but because I had intended to embody in this the results of a considerable amount of work done during the year, and I find that the rush of work at the last of our term has made it impossible for me to do more than write a note descriptive of the methods used, and to give a few illustrations of its use. Last fall I published a preliminary statement of a method for obtaining alternating current curves, and it has proved so satisfactory that we have used it in a number of investigations of alternating current phenomena.

The first real representation of an alternating current curve was made by Joubert, who employed a contact piece rotating with the armature of a dynamo, touching a fixed brush at a point of the revolution determined by the position of the brush with relation to the dynamo poles. He obtained a curve for current which was approximately a sine curve. Later, in 1888, Messrs. Wilkes, Hutchinson and myself modified the method to obtain the curves for electromotive force and current in the primaries and secondaries of induction coils. This modification was used afterward at Cornell, where Professor Ryan and others made valuable experiments, and it has been more or less generally employed. The principal difficulties lie in the fact that with a single commutating arrangement but one curve can be taken at a time, and as an experiment involving four curves takes something like 45 minutes, the condition may seriously change; while the whole voltage of the dynamo is at times on the commutator. It is at best rather a tedious method. In our work referred to above, and in the work at Cornell, electromotive forces were measured by an electrometer, and currents were obtained by getting potential differences at the terminals of a non-inductive resistance through which the current passed. Lately, in France, two commutating arrangements have been used to give two curves at once, with a condenser charged through the contact and discharged through a d'Arsonval galvanometer.

By the method which I described last fall, any number of curves may be obtained simultaneously, with only a few volts on the commutator, and with a rapidity and accuracy much greater than by the other methods. Briefly, a number of dynamometers are used, equal to the number of simultaneous curves to be obtained. These dynamometers are very cheap and convenient. The first ones used were made by Mr. Carichoff and myself, and were quite satisfactory, but experience having suggested some improvement, and our time being fully occupied, Messrs. E. S. Ritchie & Sons made four of them, such as are shown in the picture, Fig. 1. I will describe them more minutely below.

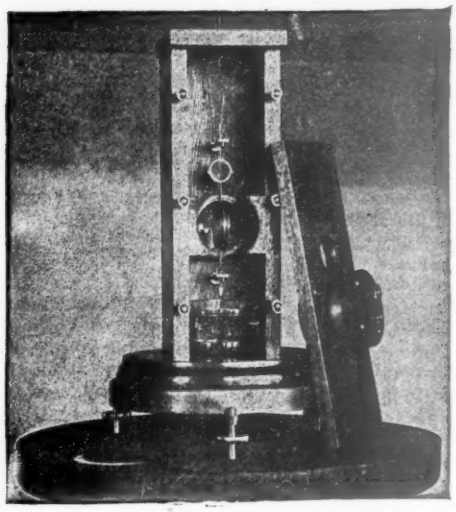

FIG. 1.

The four dynamometers have their stationary coils wound for, say, primary current, primary electromotive force, secondary current and secondary electromotive force. The movable coils are wound with fine wire, and are all connected in series. The electromotive force instruments are made exceedingly sensitive, so their self-induction may be made a minimum, and in series with them is placed a large non-inductive resistance, the relation of the self-induction and resistance being made such that the former may be neglected. The circuit of the movable coils is through a battery of a few storage cells to a brush which may be moved by hand through the arc of a circle, and which touches a contact piece on the dynamo shaft once every revolution. The other end of the circuit being joined by a sliding connection with the contact piece, the circuit is closed through the cells and coils for a short period once every revolution. The instant of closing this circuit is determined by the position of the movable brush with respect to the dynamo poles. Now, suppose an alternating current is sent through the stationary coil of one of the dynamometers. If an instantaneous current be sent through the movable coil, an impulse will be given it dependent on the value of its current and on the instantaneous value of the current in the stationary coil; as the period of the coil is great compared with the period of the dynamo, we will get a steady deflection dependent on this product. If, now, we move our contact brush, the instantaneous current will pass at some other point on the alternating current wave, and our deflection will be proportional to the value of the current at this point; by moving the brush through an angle corresponding to a complete wave we can plot the wave exactly, providing we have properly calibrated our dynamometer.

It is apparent that in order to attain accuracy our instantaneous current must be very brief and steady, and its value must be the same in actual work as in calibrating. A d'Arsonval galvanometer in the circuit allows us to judge the two last points, and we found that when a high resistance was used in the circuit, so that any variation in the contact resistance was eliminated, almost absolute steadiness was obtained. It was also assured by using a condenser charged during part of the revolution and then discharge by the contact brush through the circuit. To give an idea of the current in this circuit, an ordinary arrangement, when the condenser was not used, was 12 volts through 1,000 ohms, and it must be remembered that this current only passes an exceedingly small part of the time.

Dynamometers.—The dynamometers were made of wood, mounted on a revolving base, so they could be adjusted with respect to the meridian. It will be seen on looking at the picture that one side is made removable to facilitate adjustments. The fixed coils are wound in two cylinders which move in and out through holes in the sides, and whose distance apart is adjusted when the instrument is calibrated, so the scale divisions read directly in volts or amperes, or fractions of them. The movable coil is suspended by a silk fibre, which gives it no directive force, but which sustains it. Directive force is given the coil and current is introduced to it through two palladium hair-springs which are fastened to stiff brass wires, which serve as the axis of the coil. A vane in a breaker filled with glycerine damps the swinging and makes the instrument absolutely aperiodic. I have rarely used instruments which give more satisfactory results, the zero is invariable, readings may be taken with great ease and rapidity, while a reversal of the current gives equal readings on the two sides of the zero. To show the rapidity of the readings, six curves, representing different quantities in a step-up-and-down transmission, were taken in a little over five minutes, and in this case two instruments were used for four curves—those at the sending and receiving ends of plant—and, therefore, had to be switched from one side to the other at every reading. Twenty points were usually taken for each wave. The curves could of course be photographed instead of observed, but the latter is so much simpler and more satisfactory that—especially in a laboratory where there are plenty of observers—I much prefer it.

Contact Arrangement.—This is shown in Fig. 2. As it comes outside of the belt, and as it was often necessary to remove the latter, the swinging arrangement shown was designed and constructed by the Messrs. Hutton. On the shaft was a hard rubber cylinder with the brass contact almost flush with its surface. The whole arrangement worked admirably. The results of our work will have to be another story. I will simply give a few to illustrate the method.

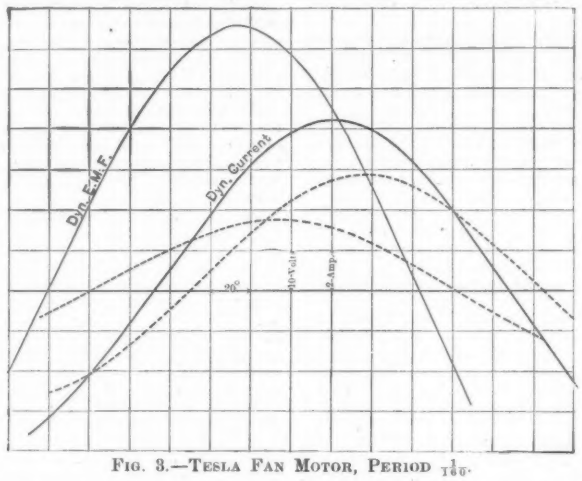

FIG. 3.—TESLA FAN MOTOR, PERIOD $\frac{1}{120}$.

We have a small Tesla fan motor, intended to work on an ordinary incandescent circuit. There are eight poles, the alternate ones having their windings in different circuits—one set of poles having a few turns of coarse wire, the others having a greater number of fine wire turns. The curves in Fig. 3 show the condition of affairs when the motor was working; in Fig. 4 where the armature was held. In the second case the energy represented corresponds, of course, only to the losses. It seems to be the general impression, by the way, that a rotating field motor starts up with the same torque as a corresponding continuous current machine. I have shown, however, that a two phase motor corresponds exactly to a converter—or rather two converters—in which the secondary has an outside resistance of $\frac{p^1}{p-p^1}$, where p^1 is the angular velocity of the armature and p that of the field. When p^1 is 0—that is, when the motor is at rest—it will be seen that the current is in the worst possible condition for starting, and the torque for a given current is small. It is like starting a continuous current motor with the brushes almost 90 degrees from the proper position.

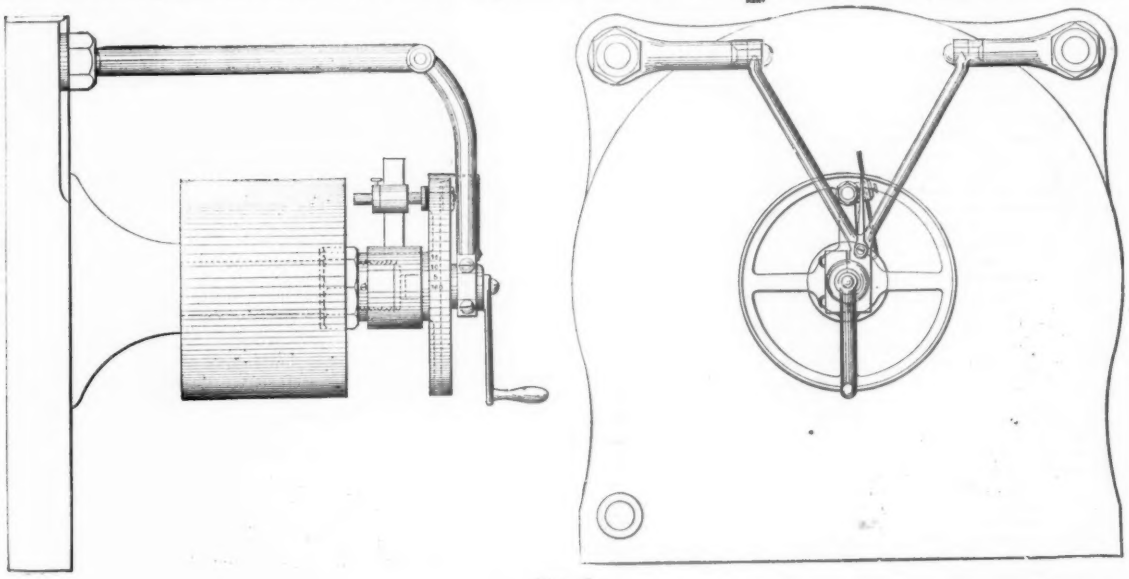

FIG. 2.

But most of our work has been with circuits in which both self-induction and capacity have been introduced. It is a well-known fact that circuits carrying alternating currents may be given the same period of vibration as the current, or, to put it another way, circuits may be so arranged that with currents of a given period the sum of the energies stored up in the circuit and given out by it, is zero. With a condenser and self-induction properly adjusted, if energy from the current is being stored up in the condenser, an equal quantity is being given to the current by virtue of the self-induction. That is, we can neutralize our self-induction by a capacity. I can hardly think of any fact more likely to play an important part in the future of alternating current work. For instance; if a circuit has in it a periodic current consisting of a number of sine curves of different periods—one-third, one-fifth, one-seventh, etc., the period of the fundamental wave; then if we put in inductive relation to this circuit another circuit whose period is, say, one-third of the fundamental wave, this current will pick out the one-third period waves in the primary.

An ordinary sine curve electromotive force may be made to give a periodic current wave with these higher harmonics in several ways—by having in the circuit a self-induction coil whose iron core is saturated when the current nears a maximum, or by using the same coil with a capacity which neutralizes one of the value of the varying self-induction; so we can produce these higher har-

monics and we can pick them out. But it is a complex subject not to be treated here. In all such experiments, however, there are several points which must be carefully attended to, or there will be very unsatisfactory results. If the iron core of the induction coil—provided such a core is used—is not properly laminated and annealed, or if there are considerable losses in the condenser, the results will be disappointing. Take the case, for example, where there are eddy currents in the core and there is loss in the condenser. The first effect corresponds to a short circuited secondary near the coil; the loss in the dielectric of the condenser means that energy is taken from the current, and this energy must be represented by the product of the current into the electromotive force, e corresponding to the transfer of energy or it is $e.i.$ The value of e is a maximum when the displacement is greatest, that is, when the current is greatest, and for a given current and dielectric varies as $\frac{1}{c}$.

If we represent these effects by a revolving diagram, as is ordinarily done, and suppose we have neutralized the self-induction by a capacity, we get something like the figure (Fig. 13). The result is that the relation between R. I. and E. instead of being 1 to 1 as would be the case were there no disturbing causes, is 1 to 1+. That is, for a given electromotive force the current is less than it should be, and a glance at the figure will show that it is thrown ahead of the electromotive force. No possible change in our self-induction and capacity can remedy this decrease in the current, although we may, of course, make the phase angle zero if we wish.

An excellent way to make an iron core, by the way, is to shellac fine, well annealed wires, spread them along a piece of thin paper, brush them over with shellac and then roll the mat so formed into a cylinder. The losses in a condenser are usually small. They are discussed in a paper of Messrs. Hutin and Leblanc, published last spring in *La Lumiere Electrique*. We find, however, that if the condenser is made of very thin tinfoil and has a large area, then for heavy currents it may considerably decrease in capacity and offer a definite resistance to the current.

The curves given have been selected almost at random from a mass of data. We have not the time to discuss the results, which are hardly within the scope of this paper. Fig. 5 gives the curves at the two ends of a transmission plant where the voltage was raised from 50 to 1,000 volts and reduced again. Fig. 6 gives the curves for the dynamo directly on the same lamps. It is seen that the transmission decreases the electromotive force and current and increases the lag of the dynamo current.

Figs. 7, 8, 9 and 10 give curves taken from the dynamo circuit when self-induction and capacities were inserted. In Fig. 7 the core of the induction coil was only fairly well laminated, and a condenser with copper sheets between paraffined paper was used. The maximum current is a little over 1.2 amperes, while it should have been about four amperes, if there were no losses in the circuit. The second point of crossing is thrown out by a change of speed of the dynamo. Fig. 8 shows the result of substituting a tinfoil condenser of the same capacity in place of the copper one. In Fig. 9 both condensers were used and a considerable part of the wire core was withdrawn. In Fig. 10, with the same two condensers, a solid iron bar was used as the core of the induction coil.

Fig. 11 gives the curves obtained in the circuit of a dynamo connected to a transformer whose secondary circuit was open.

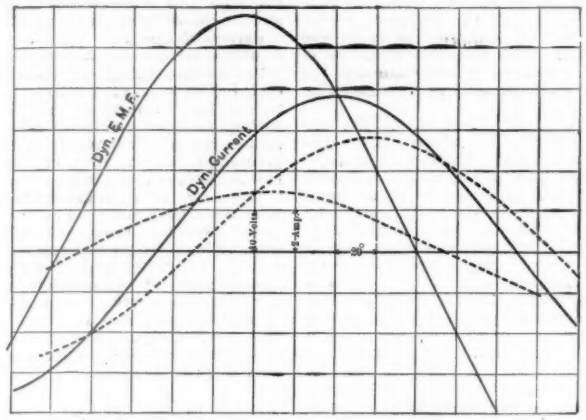

FIG. 4.—TESLA FAN MOTOR.—HELD. PERIOD $\frac{1}{185}$.

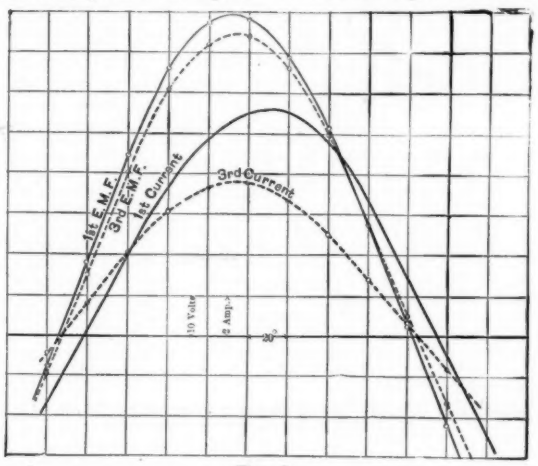

FIG. 5.

DISCUSSION.

Prof. Henry S. Carhart: Mr. Chairman, I wish to say a word, not at all in criticism of Dr. Duncan's paper, but rather to give some of my own experience in this matter. We have succeeded, by a very simple means, in getting these curves with only two observers, taking 20 points in five minutes. I have written off a few of the curves, but they are on a small scale. The apparatus is in general similar to that used in the older method, connected to the end of the shaft of the armature, with sliding contact. The instrument is well made and has worked perfectly from the start. The shunt is taken off from a single lamp of non-inductive resistance, 24 lamps across the primary. The current was 10,000 volts. I am not certain yet whether the lag between the current and the electromotive force comes out properly or not. In that case we use a galvanometer. In another instance the same apparatus is used, except that we use an electrometer. They came out better and faster and are very satisfactory. The calibration was what I was about to speak of. An instrument made under precisely the same conditions with saturated paper, was put in place of the shunt around the lamp, and then run through the machine in exactly the same way and through a commutating arrangement on the machine. We run this with precisely the same apparatus. Dr. Duncan's method very likely worked more rapidly, but this certainly answers very well for ordinary purposes.

Dr. Edward L. Nichols: I should like to say, Mr. Chairman, that it seems to me that the paper, together with other work which we know of that is going on at the present time along these lines, goes to show what progress has been made in this kind of measurements within the last few years. We can all remember the time, when to get such curves at all was regarded as an achievement, a little later on it took an hour, then 45 minutes was boasted of as something wonderful. Now we have the statement that these simultaneous curves were obtained in five minutes. Professor Carhart tells us that he has taken them by the old method in five minutes. The world has seen great development in alternating current measurements. It seems to me that Dr. Duncan's paper is chiefly important, therefore, not on the question of rapidity, but in the fact of getting absolutely simultaneous values for two curves, so that no change can take place between the taking of the electromotive force curve and of the current curve. There is no lapse of time during which some change of condition might occur to vitiate the result.

Professor Carhart: I forgot to say, Mr. Chairman, that our apparatus was provided with two disks, but we could just as well have put on four, and got three of four contacts at the same time, and measured three of four curves at the same time.

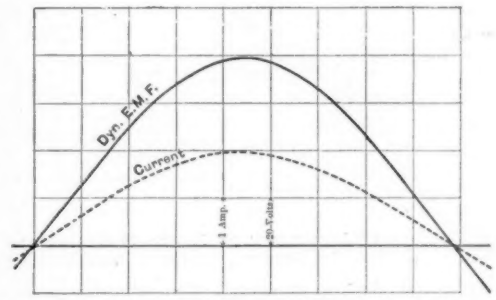

FIG. 9.—TINFOIL IN PARALLEL WITH COPPER CONDENSER WITH COILS. CAP. 2.675 M.F.'S. WHITE CORE.

It is rumored that Pettingell, Andrews & Company, capital $250,000, and the Eastern Electrical Supply Company, capital $500,000, both of Boston, will consolidate.

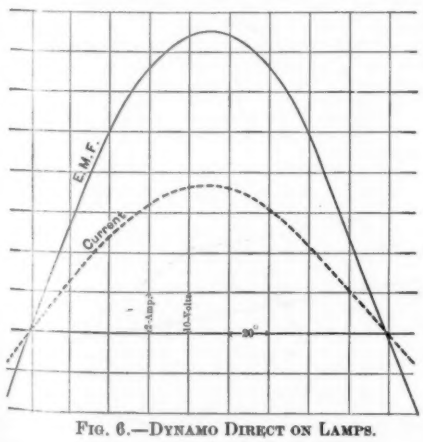

FIG. 6.—DYNAMO DIRECT ON LAMPS.

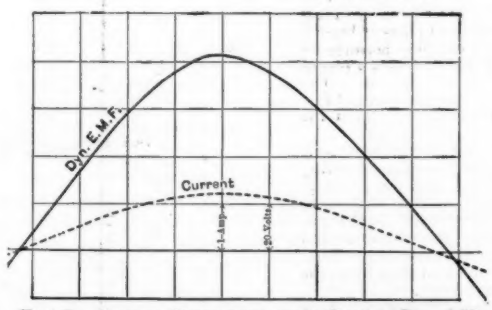

FIG. 7.—COPPER CONDENSER WITH COILS. CAP. 1.35 M.F.'S. WIRE CORE.

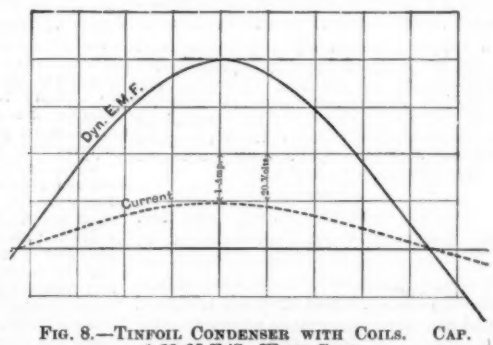

FIG. 8.—TINFOIL CONDENSER WITH COILS. CAP. 1.33 M.F.'S. WIRE CORE.

LITERARY.

We have received the "Journal of the United States Artillery" for July.

F. B. Thurber, whose opinion in commercial affairs is of weight, discusses business in Presidential years in an article announced for the August number of the *North American Review*.

We have received No. 62 of the "Proceedings of the United States Naval Institute." In the bibliographic notes considerable space is given to an article on electric lighting of buoys which appeared in the ELECTRICAL REVIEW for March 12, 1892.

The Popular Electric Monthly, Vol. 1, No. 1, made its appearance in Chicago on July 15. The price is $1 per year. Mr. Geo. O. McKibben is business manager of the enterprise. The magazine will cater to the popular taste and will endeavor to succeed along popular lines. We wish it luck.

The Bethlehem, Pa., Electric Light Company has sent us a copy of the sesqui-centennial edition of the Bethlehem *Daily Times*. It is a 40 page sheet with colored cover, and is replete with half-tone engravings of prominent men and things in Bethlehem. It reflects great credit on its projectors and should do much good for Bethlehem.

The Historic Moment in the August (Fiction) Number of *Scribner's*, on "Driving the Last Spike of the Union Pacific," is by the late Sidney Dillon, to whose great energy and faith in the project the completion of the road was largely due. The article received his final revision only a few weeks before his death. It is a graphic narrative of a memorable ceremony.

Mr. Bok has succeeded in unearthing a quantity of unpublished material by Henry Ward Beecher, which will shortly be published as a series of articles in the *Ladies' Home Journal*. The material is especially valuable since it deals with a range of topics both varied and timely, and will advance, for the first time in print, the great preacher's views on a number of such interesting questions as marriage, home government, women in public and private life, politics, etc., etc. Mr. Bok has secured the co-operation of Mrs. Beecher and Professor Ellinwood, Mr. Beecher's private reporter, in the editing of the material.

The second volume of the third issue of Prof. J. A. Fleming's scholarly work, entitled "The Alternate Current Transformer in Theory and Practice," is ready for delivery. It will be remembered that Volume I of this work, which appeared a short while ago, dealt with the induction of electric currents. The second volume covers the utilization of induced currents. The work as a whole constitutes a complete exposition of the subject of the alternate current transformer, dealt with in an elementary manner. The price of Volume I is $3, while that of Volume II is $5. These books are sold separately if desired, and will be forwarded, on receipt of price, by the ELECTRICAL REVIEW, 13 Park Row, New York.

The Standard Battery Company's Iron Gravity Battery.

For years past the only battery that was used for producing the electric current for local service in telegraphy was the gravity or crowfoot cell. In a cell invented by A. P. Willoughby, Esq., of Chicago, Ill., the zinc element or electrode is entirely dispensed with, and an electrode of iron, treated with a peculiar alloy, is substituted entirely for that of zinc. Its commendation to the general public, that is, all persons who use the battery for the purpose indicated, is claimed as economy between the cost of iron and zinc as electrodes, the cost of cleaning the old crowfoot or zinc electrode, and the absolute condition of no corrosion that takes place in the action of the gravity cell. It is claimed the iron electrode needs no care, no cleaning, but simply when it is used up it is replaced by another of the same character; that the current increases constantly in strength from month to month, as demonstrated by the use of the batteries in practical telegraph work in the office of the superintendent of the telegraph system of the Chicago, Burlington & Quincy R. R., the current being higher in its potential and amperage, and very much lower in its internal resistance, than at any time since the battery was set up. We are informed that a test was made by Prof. H. S. Carhart, of Ann Arbor, to whom was given two of the iron gravity cells in the early part of the month of May, and up to the date of June 10, 1892, they have been running constantly, and that the test showed that the internal resistance has fallen from 3.5 ohms per cell to a little less than .9 of an ohm, while the current is increased from .6 to 1.08 amperes. The internal resistance fell rapidly during the first two days, but the current increased in almost equal proportion. Referring to the statement made concerning the action of the battery with the C., B. & Q. R. R., Mr. Willoughby refers any one to Mr. W. W. Ryder, superintendent of the telegraph system of that road. There are now over 40 of the superintendents of the different trunk lines throughout the United States testing these batteries under their own supervision, and every one has reported favorably in the extreme as regards their experiments. One important feature of Mr. Willoughby's invention is simplicity. The iron electrode has simply to be substituted for the zinc and inserted in the sulphate of copper solution, requiring no change of cells, no change of elements, excepting the introduction of the iron electrode. The Standard Battery Company, of Chicago, Ill., 324 Dearborn street, have purchased the right and franchises of Mr. Willoughby for this discovery, and the battery is known as the Iron Gravity Battery.

Ex.-Gov. Henry Howard will retire from the presidency of the Providence, R. I., Telephone Company about August 1, tendering his resignation at the next regular meeting of the board of directors. It is stated that no special significance attaches to Mr. Howard's retirement, which is due simply to a desire to relieve himself of the cares and responsibilities of his present position, which he has held since the organization of the company.

Ex-Mayor A. M. Norton, aged 70, superintendent of the Nashua, N. H., Light, Heat and Power Company, died suddenly last week of heart disease. He was a very prominent democrat.

Grounding the Neutral Wire in Athens, Greece.

The following is a translation of a letter from a correspondent of the *Electrotechnische Zeitschrift* at Athens, Greece:

About three years ago we employed in the central station at Athens, Greece, the method of grounding the neutral wire. The ground consisted of a lead pipe of 1,200 m. and 50 mm. diameter. This pipe served as a water pipe for the central station, conducting the water from the Ilyssos brook. At ten points the bus wire was soldered to the lead pipe which runs parallel with the neutral wire. This pipe is not buried in the ground, but lies in a channel, being placed in a plank conduit. At first this arrangement worked well, and we were just about thinking to employ an entirely uninsulated neutral conductor, when the burning through of one of the lead cables called our attention to the possible danger.

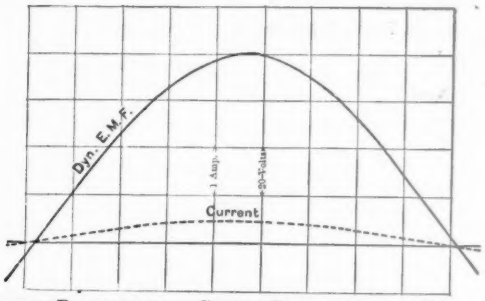

FIG. 10.—TINFOIL IN PARALLEL WITH COPPER CONDENSER WITH COILS. CAPACITY 2,675 M.F.'S. SOLID 1¾ INCHES IRON CORE. RESISTANCE OF CIRCUIT, 20.3ω.

The lead cables at Athens are all placed in wooden troughs covered with a solution of pure wood tar and resin. These troughs seem to wear well, and we have not observed yet that the gradual decaying of the wood and acid resulting therefrom has had any effect upon the lead pipes. In fact, all the gas pipes used at Athens are laid in precisely the same manner. In our arrangement we did not use the lead pipes of branch conductors as the neutral wire, because we desired in case of accidents to have a means of quickly insulating our system. The only ground, as above stated, consisted in a single water pipe, to which we soldered the neutral wire of the main conductors.

Upon examination the burned lead cable showed a series of small pin holes extending for a distance of 20 m., and this phenomenon led us to believe at first that these holes had been caused by static discharges. However, a more careful inspection proved that the damage resulted from a slow chemical disintegration of the lead sheathing, the cause of which was uncertain.

Soon other accidents followed. Now there was a positive conductor at fault, now a negative one, and these troubles caused us to employ greater care in the insulation of the entire installation; moreover, at various periods we carefully measured the insulation resistance of all conductors. One thing became evident, *i. e.*, that the grounding of the neutral wire had largely increased the chances of danger to the pipes from burning through, for we found that strongly insulated conductors soon became faulty, and at last useless. A short time ago we were notified that the water pipe had become leaky. A careful investigation revealed the fact that the entire pipe showed a series of small holes, in fact, we noticed exactly the same signs of chemical disintegration of the metal which we had observed in examining the burned through cables. The walk on which the pipe is laid is at several points covered by water, continually flowing into the channel, and this water contains a small amount of oxygen. Now, at these points the pipe was intact, but wherever it touched the damp masonry of the walk without being flooded by the running water, the pipe was perforated. At the points where the pipe touched the masonry the metal was badly oxidized and crumbled at the mere touch, and especially noticeable was the chemical disintegration at the soldering points.

At first we doubted that the trouble had been caused by electrolytic action, but when we found that other lead pipes which were not attached to electrical conductors, but which had been placed in the same channel, showed no trace of damage, we were forced to believe that the disintegration of the metal had been caused by the electrical current. Again, the fact that the pipe was badly damaged at the points to which the conductors had been soldered, while wherever the pipe was surrounded by flowing water scarcely any damage could be detected, strongly argued for the correctness of our assumption. However, we have not concluded our experiments, nevertheless we believe that the grounding of the neutral wire should not be recommended. We are well aware that it is urged by its advocates (1) that such use permits the employment of an uninsulated conductor and (2) decreases danger from short circuits.

As to the first point, we think it would be dangerous to lay an entire system, using an uninsulated neutral wire. An additional great disadvantage, furthermore, consists in the difficulty of making accurate insulation tests, the neutral wires being grounded.

As to decreased danger, we are led to think that the danger is rather increased. Again, it will be necessary to use two lead pipes for each branch conductor, while with a well insulated system one lead pipe would be sufficient. Moreover, the danger resulting from short circuits is increased with chandeliers, where flexible conductors have to be employed. Occasional short circuits are quickly seen and detected in well insulated systems.

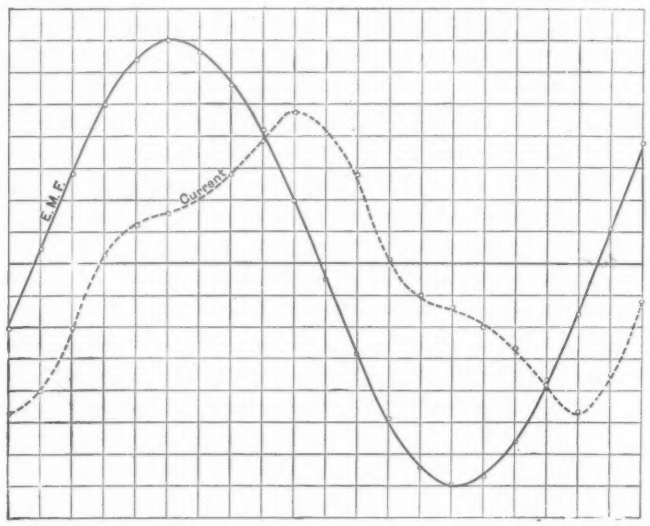

FIG. 11.—SIEMENS' DYNAMO ON TRANSFORMER; SECONDARY OPEN. CURVES TAKEN WITH EXPERIMENTAL DYNAMOMETERS.

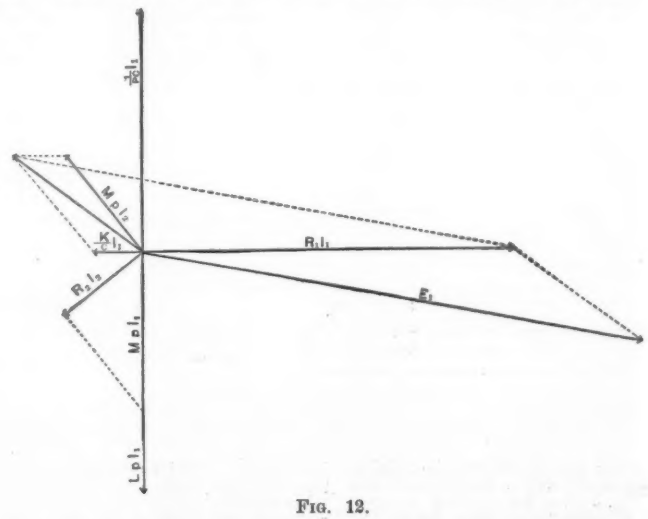

FIG. 12.

Bartlett's Beautiful Brochure.

Bartlett & Company, 21 and 23 Rose street, New York, is the name of a firm of designers, engravers and printers, which has become a synonym in the electrical field for the best work. The many catalogues, advertising leaflets and other printed matter bearing Bartlett & Company's imprint, which the ELECTRICAL REVIEW has received from time to time, show that high class printed matter is appreciated and purchased by electrical manufacturers.

Bartlett & Company have focused their combined talents on a beautiful and artistic little brochure telling about their business, their facilities and their work. It is called "A Modern Triumvirate," and, after comparing the three gentlemen composing the firm to the old triumvirate of Latin days, proceeds to tell the story of their business in a unique and readable way.

The cover is an embossed design of remarkable artistic merit, while the title page carries a half-tone design which is a little gem. The letter-press is printed in brown and the illustrations, all of them half tone reproductions of wash-drawings, are rendered in olive-black. "A Modern Triumvirate" was produced in its entirety under Bartlett & Company's roof and is living evidence of their ability to produce the best possible printed matter.

New Jersey Electrical Subway Commission.

The New Jersey State Electrical Subway Commission, at a recent meeting held in Trenton, passed a set of resolutions which will be of great interest to telephone, electric light and cable companies in every city in New Jersey. This was the first meeting of the commission at which any business of importance was transacted. After discussing the law under which they were created, they passed resolutions to the effect that the erection of wires by any telephone, electric light or electric railroad company in any city of the State without the consent of the board would be illegal, and, in order to give such companies a chance to make application, they will hold a meeting every Tuesday, when such applications will be considered.

It was also decided that all wires in first-class cities should be placed under ground, and the secretary was instructed to notify the officers of such companies in Jersey City and Newark. The Commission will sit at the State House, Trenton, on September 6, to hear argument in reference to placing the wires under ground.

Stealing Electricity.

There is, at last, something new under the sun. An enterprising citizen of St. Louis has been arrested for the offense of tapping the wires and securing his private supply of electricity free of expense. The lawyers and judges are puzzled to know what to do with the case, as there is no statutory penalty provided for it, and it is doubtful whether it can be treated as a common law felony.

It is fortunate that Dr. Benjamin Franklin was not arrested for the same offense. He was the first to steal lightning from the clouds; for we do not take any stock in the old chestnut about Prometheus stealing fire from heaven, and Dr. Franklin, with his kite and key, was, undoubtedly, the first to perpetrate the theft, which suggested to Turgot the fine phrase, "Eripuit coelo fulmen sceptrumque tyrannis."

Franklin, while carrying on his experiments, was probably regarded by his skeptical neighbors as a little "daft," but nobody seems to have thought of proceeding against him criminally for the theft.—*Brooklyn Standard Union.*

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week:

New Electric Railways.

LE MARS, IOWA.—A. C. Colledge is an applicant for a franchise to construct an electric railway in this city.

OSKALOOSA, IOWA.—The largest mortgage ever placed on record in Mahaska County was filed by the Oskaloosa Electric Street Car Company in favor of the New York Loan and Trust Company, and calls for $100,000. This secures the capital for the construction of the seven miles of electric railway in this city.

CHICAGO, ILL.—The control of the Love Electric Traction Company, with a capital of $10,000,000, has passed into the hands of Philadelphia, Boston and Baltimore operators. It is believed that this syndicate will establish the electric system in both the West and North Sides wherever the cable system is not already in operation.

DETROIT, MICH.—The stockholders of the Detroit, Fort Wayne and Belle Isle Street Railway Company have voted to bind the road to the amount of $400,000 to pay for electrical equipment and reconstructing the tracks preparatory to introducing rapid transit.

PITTSBURGH, PA.—The Central Passenger Railway Company will construct an electric railway to operate partly over the tracks of the Central Traction Company.

COLUMBUS, O.—There is a movement on the West Side to get another electric street railroad.

ALTON, ILL.—The stock in the State Street Electric Railway Company has been subscribed, as the application for a charter has been filed with the Secretary of State.

CHARLESTON, W. VA.—H. D. Ruffner, John L. Thornhill, and others have applied to the city council for a franchise to build an electrical railroad.

PHILIPSBURG, PA.—The Philipsburg Horse Car Company has been granted permission to change its motive power to electricity.

NEW ORLEANS, LA.—J. Hart, who has a franchise for a street railway, will let contracts shortly for an electric line.

DURANGO, COLO.—The Durango Street Railway Company has been organized with a capital stock of $250,000, for the purpose of building a street railway in Durango, and other parts of La Plata county. Directors, George Ditchfield, S. E. Herr, W. G. White, W. S. Pickerill and M. J. McClosky.

PORT GARDNER, WASH.—Articles of Incorporation of the Port Gardner, Lake Stevens and Eastern Railroad Company, with a capital stock of $250,000, have been filed. The incorporators are John F. Hart and J. M. Davis, and the principal objects of the incorporators are to build and operate a railroad between Everett and Lake Stevens, and to erect and conduct electric plants for manufacturing and lighting.

MACON, GA.—The Macon and Indian Springs Railway Company will erect an electric power house.

SAVANNAH, GA.—The work of equipping with electricity the Coast Line Railway—J. H. Parsons, president—will commence at once.

ST. LOUIS, MO.—The biggest street railroad reconstruction ever known in this city has been decided upon. It will convert into electric roads the Cass Avenue, Northern, Central Union and the extension of the Fifth Avenue Cable Company. The cost will reach over $1,500,000, not including rolling stock. All the roads will be operated by October. The improvements will cover 37 miles and take about 40 miles of wire. The system will be operated from one mammoth plant, the largest of its kind in America.

BROOKLYN, N. Y.—The vetoes of Mayor Boody of the resolutions passed by the aldermen granting franchises for electric lines to the Union Railway Company and to the Coney Island, Fort Hamilton and Brooklyn Railroad Company, were over-ridden, by a vote of 16 to 2, at a recent meeting of the aldermen.

OAKLAND, CAL.—The Oakland, San Leandro and Haywards Electric Railway Company has acquired the Twenty-third Avenue horse car line, and will convert it into an electric road.

MILWAUKEE, WIS.—Articles of incorporation have been filed by the Milwaukee and Layton Park Street Railway Company. It is proposed to build a railroad, to use cable, electric or horse-power, from Lake to Greenfield. The incorporators are Frederick T. Day, Wm. Sanderson and Chas. L. Clason. Capital $10,000.

SAN FRANCISCO, CAL.—The San Francisco Contract and Equipment Company; capital, $100,000. Directors, William Montgomery, T. D. Hoskins, Witscher Jones, A. E. Shattuck and E. F. Staples. The object of the company is to build, equip, lease and operate street railroads in this city.

MILFORD, NEB.—A company will be organized to build an electric street railway to Lincoln.

NEW HAVEN, CONN.—H. B. Ives, president of the Fair Haven and Westville Railway Company, says that "the company has decided to use electricity, and the only thing that remains to be decided upon is what system we shall adopt."

NEW ORLEANS, LA.—A scheme is being promoted for the consolidation of all the street railways of the city and their operation by electricity. The deal involves $10,000,000.

STONEHAM, MASS.—A petition has been presented to the selectmen by the Boston, Malden and Stoneham Street Railway Company, asking permission to erect poles, string wires and locate tracks for an electric railway.

GRAND FORKS, N. D.—The Grand Forks Electric Street Railway Company, C. T. Arelle, president, and L. C. Stephens, secretary, has been granted a franchise for a street railway system, to be operated by electricity.

PITTSBURGH, PA.—At a meeting of the directors of the Kensington Street Railway Company it was decided to commence the construction of the road at once. Electricity will be the motive power.

BROOKLYN, N. Y.—Articles of incorporation for the New York, Mapleton and Van Pelt Manor Railroad, which is to be another electric line to Coney Island, have been filed. Andrew D. Baird, Cornelius Furguson, Jr., Wm. P. Rae and J. P. Puels are among the incorporators. At a special meeting of the stockholders of the Brooklyn City Railroad Company a resolution, increasing the capital stock from $6,000,000 to $12,000,000, was passed. The object of the increase is to provide for the equipment of the road with the trolley system.

NORTH ATTLEBORO, MASS.—The North Attleboro Steam and Electric Company has re-organized as follows: President, H. M. Daggett, Jr.; treasurer, W. M. Otis, of Providence; clerk, C. T. Guild.

JERSEY CITY, N. J.—The Passaic Electrical Transit Company; capital stock, $1,500,000; has been incorporated by J. B. Newcomb, of New York city, R. S. Fowry, of Nyack, N. Y., and W. H. Taylor, of Scranton, Pa. It is alleged that this is a portion of the big syndicate scheme which will unite Newark, Paterson, Elizabeth and Jersey City by an electric railroad.

New Electric Lighting Companies.

HOPKINSVILLE, KY.—John P. Martin, of Dayton, O., has the contract to build an electric light plant and street railway at this place.

RAT PORTAGE, CAN.—Stewart & Hooper, of Winnipeg, Man., have secured the contract for an electric light plant of 2,000 lights to be installed for the Citizens' Electric Company.

OSAGE, IOWA.—The Osage Electric Light Company has been granted an electric light franchise for a long term of years.

ASHLEY, PA.—Frank J. Richards is at the head of a company organizing to erect an electric light plant.

JACKSON, MICH.—The city council has been petitioned to grant a franchise to the Fort Wayne Electrical Company.

BUTTE, MONT.—This city contemplates establishing a municipal electric light plant.

STEELTON, PA.—A new electric light company is being formed by the citizens.

HEMPSTEAD, L. I., N. Y.—The Ball Electric Light Company's proposition to erect an electric light plant has been accepted by the village trustees.

FAYETTE, MO.—Fayette, at a special election, voted to issue $12,000 in bonds for the purpose of establishing an electric light plant.

YORK, PA.—The Westinghouse Electric Light Company; capital, $50,000. L. A. Marshall, president; M. M. Hydeman, vice president; Edward Stuck, secretary; and R. H. Shindel, treasurer. Work on the erection of a plant will be begun at an early date.

ORANGE CITY, IOWA.—Orange City Electric Light Company; capital, $16,000. Promoters, M. E. Lewis, E. H. Casjens, A. Vander Meide, Jerome Fisher and M. Rhynsburger. Incorporation papers sent to A. Vander Meide, Orange City, Iowa.

Light, Heat and Power.

CHICAGO, ILL.—The Northwestern Electric Light and Power Company; capital stock, $25,000. Incorporators, George W. Bryson, Francis M. Charlton and Perry L. Shuman.

STEELTON, PA.—Samuel Couffer and Christian Hess have effected a temporary organization of a proposed electric light-heat and power company.

CHICAGO, ILL.—The North Shore Heat, Light and Power Company; capital, $100,000 Incorporators, Jno. D. Cameron, James D. R. Graham and B. L. Gorich.

COVINGTON, KY.—Covington Light and Water Company; capital, $75,000. Incorporators, William S. Reed, Charles B. Ensign and George A. Harris.

RUBY, WASHINGTON.—The Ore Town and Improvement Company, of Ruby, Washington, has been incorporated with a capital stock of $300,000. The directors are Robt. Allison, S. C. Stanton, Henry Carr, Robt. Hunter and Chas. E. Laughton. The object is to build railroads, operate and own electric light, gas and power works.

LEMONT, ILL.—Lemont Electric Light and Power Company has been incorporated with a capital stock of $20,000, by J. G. Bodenschatz, H. S. Norton, P. A. Nelson, F. J. Huston and Hubert Sauber, to furnish electric light and power.

OTTAWA, KAN.—The Ottawa Waterworks and Light Company has been organized with a capital stock of $100,000. The new company has purchased the plant of the Ottawa Waterworks and Electric Light Company.

BAYONNE, N. J.—An ordinance granting a franchise to the Bayonne Electric Light Heat and Power Company has passed the City Council.

New Manufacturing Companies.

NEWARK, N. J.—The Home Electrical Concern of New Jersey; capital, $100,000, of which $1,000 is paid in. Incorporators, Eugene Ellery, of Brooklyn, N. Y.; Morris Ruebins, of New York city; and Thomas C. Barr, of Orange, N. J.

MANCHESTER, N. H.—The Oulton Manufacturing Company; capital, $50,000, has been incorporated to manufacture household and electric goods.

CINCINNATI, O.—The Gray Telautograph Company, of Chicago, contemplates establishing here a branch factory for the manufacture of its electrical appliances. The principal Cincinnati stockholders are Peter Tracy, H. S. Kimball, James Veazey, Henry Lewis, H. P. Cooke and R. G. Dunkerson.

Capital Stock Increased.

GALLIPOLIS, OHIO.—The Gallipolis Street Railway Company has increased its capital stock from $40,000 to $60,000.

PHILADELPHIA, PA.—The Bell Telephone Company, of Philadelphia, will increase its capital stock from $540,000 to $1,000,000. The additional capital is needed for improvements and extensions.

ALBANY, N. Y.—The directors of the Municipal Gas Company voted to increase the capital stock from $1,500,000 to $2,000,000. The company will manufacture electricity for lighting, and its articles were so amended. Anthony N. Brady is president, and John E. McElroy, secretary and treasurer.

Improvements.

SOUTH BEND, IND.—The South Bend and Mishawaka Street Railway Company is to expend about $25,000 in the improvement of its line.

JANESVILLE, WIS.—General Manager McLeod states that if Janesville will grant a franchise the Wisconsin Telephone Company will spend $10,000 rebuilding its lines in this city.

Telephone, Telegraph and Electric Power.

SAN FRANCISCO, CAL.—Tiburon Point Villa Association has been organized with a capital of $250,000. Directors, Thomas B. Gardner, P. T. M. Wate, Arthur M. Hill, Edward M. Hill, Walter K. Freeman. To operate railroads, electric power, telegraph and telephone lines.

New Telephone Companies.

BINGHAMTON, N. Y.—The Binghamton Pulsion Telephone Company; capital, $20,000; has been incorporated by N. L. Osborn, G. C. Rogers and others, to build a telephone line connecting the principal suburban villages.

Electric Door Plate Company.

CHICAGO, ILL.—The Electric Annunciator and Indicating Door Plate Company; capital, $50,000. Incorporators, Michael McInerny, Edward J. Dunn, Martin J. Dwyer and John McKeough.

KINDRED INTERESTS

Merchant & Company, Philadelphia, issue another of their artistic brochures, advertising Spanish tiles made in copper, tin and steel.

The McIntosh-Huntington Company, Cleveland, O., have secured the contract for all the feed and trolley wire required for the equipment of the Woodland Avenue and West Side Street Railroad, of Cleveland, at their bid of $60,000.

The Advertisement in another column, headed "$4,400 Cash," is a good opportunity for any one desiring to purchase an electrical supply business in a growing town of 39,000 population. Replies should be addressed to "Business," care of this office.

The Perkins Electric Lamp Company, of Manchester, Conn., have shut down their works for a short time, in order to make some necessary repairs on their large engine. This is usually their dull season, but during the present summer they have been unusually busy. They are keeping their full winter complement of hands employed, notwithstanding the long days and ordinary light demand for lamps at this season.

Mr. F. R. Chinnock, 18 Cortlandt street, New York, agent for the Ball Engine Company, of Erie, Pa., has made the following sales during the past six weeks: Prohibition Park Railway Company, Port Richmond, one 150 horse-power engine; F. O. Matthiessen, chairman Manufacturing Committee American Sugar Refining Company, two 100 horse-power engines for Baltimore; Baltimore Traction Company, Baltimore, Md., two 130 horse-power heavy duty engines; F. H. Beggett & Company, New York City, one 50 horse-power engine; Metropolitan Telephone and Telegraph Company, New York City, one 60 horse-power; Brokaw Bros., New York City, two 150 horse-power and one 80 horse-power engines; H. Ward Leonard & Company, New York City, one 150 horse-power engine; Curtis & Dean, New York City, one 60 horse-power engine; Royal Light, Heat and Power Company, Front Royal, Va., one complete steam plant, 100 horse-power engine and 125 horse-power boiler; Hot Springs Electric Company, Hot Springs, Va., one complete steam plant, 100 horse-power engine and two 80 horse power boilers; for Guantanamo, Cuba, one 80 horse-power engine: C. S. Furst, Newark avenue, Jersey City, N. J., one 50 horse-power engine, one 80 horse-power boiler; Buffalo, N. Y., Board of Trade, one 60 horse-power engine; Navy Yard, Brooklyn, N. Y., two 80 horse-power engines.

The Electric Light on Forage Duty.

The public is familiar with descriptions of the destruction of birds of passage from flying at the lamp chambers of lighthouses, dazzled by the light, and of the immense number of insects that fall victims to the glare of the street arc lamps in the summer months, but an entirely new phase of this relation of the electric light to natural history is reported from Kansas, according to the Pittsburgh *Dispatch*. It appears that the salt marshes, which extend for several miles in each direction north of Hutchinson, are a favorite resort every season for wild geese. The birds flock to the marshes in such numbers that they are pursued by a whole army of hunters in the spring and fall, and the district is besieged by men who make a business of supplying the market with wild fowl. Some time ago the city concluded to use the electric light for the streets, and some of the lamps were placed high above the buildings, so that they cast their light a great distance. Large numbers of geese have been picked up that have been dashed to death against the poles and rods around the lamps, so that a diligent patrol of the streets after dark proves profitable to the man who is in search of a dinner either for himself or some one else. A policeman on his beat is said to have been recently hit in the back with such force as to be knocked flat on the ground. Picking himself up hastily, and drawing his club to repel the unexpected invasion, he looked around for his antagonist, but there was none to be seen. On the ground, however, was a fine gander with a broken neck.

WANTED.—Position as Superintendent of an Electric Light or Power Station by a practical Steam and Electrical Engineer of long and varied experience.

References exchanged.

Address, "ENGINEERING,"
Care ELECTRICAL REVIEW, Boston Branch,
620 ATLANTIC AVENUE, BOSTON.

NOTICE.

Notice is hereby given that the City of Springfield, Mo., will receive sealed proposals up to twelve o'clock, noon, of Tuesday, the 6th day of September, 1892, for furnishing said city and the citizens thereof with electric lights.

Specifications and form of proposal will be furnished on application to the City Clerk.

By order of the Council,

C. W. HACKNEY,
City Clerk.

$4,400 CASH

Buys a stock of Electrical Supplies, good will of business, present contracts, etc., if taken at once. Business established in growing town of 39,000. Goods alone inventory $4,600, market value. Copy of inventory confidentially furnished on application. Address,

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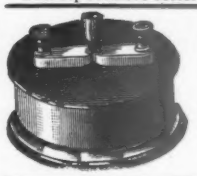
Promote and contract for the construction of Electric Light Plants and Street Railways.

Correspondence solicited.



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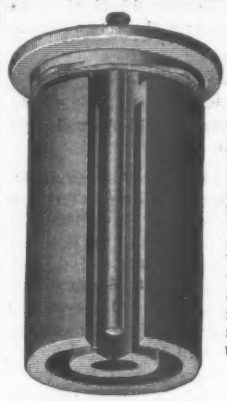

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Engine Lathes, 10 in. x 4 ft.; 11 in. x 5 ft.; 12 in. x 6 ft.; 14 in. x 6 ft.; 16 in. x 6 ft.; 18 in. x 8 ft.; 20 in. x 8 ft., with tapes attachment; 22 in. x 12 ft. and 14 ft.; 24 in. and 26 in. x 16 ft.; 30 in. x 10 ft. and 18 ft.; 36 in. and 38 in. x 20 ft.; 42 in. x 12 ft.; 27 in. x 32 ft.; 88 in. x 31 ft.; 96 in. x 20 ft. Fox Lathes, 13 in. x 5 ft.; 14 in. x 5 ft.; 15 in. x 6 ft.; 18 in. x 6 ft. Turret Lathes, 12 in. x 5 ft.; 14 in. x 5 ft.; 15 in. and 16 in. x 6 ft.; 18 in. x 6 ft.; 36 in. x 8 ft.

Planers, 16 in. x 16 in. x 3 ft.; 20 in. x 20 in. x 4 ft.; 24 in. x 24 in. x 6 ft.; 30 in. x 30 in. x 6 ft.; 36 in. x 36 in. x 10 ft.; 42 in. x 42 in. x 12 ft.; 44 in. x 48 in. x 22 ft.; 60 in. x 49 in. x 24 ft.

Friction Shapers, 15 in., 16 in., 20 in., 22 in., 32 in.

Crank Shapers, 6 in., 8 in., 10 in., 12 in., 13 in., 16 in., 17 in., 20 in., 24 in., 28 in.

Screw Machines, Nos. 1, 2, 3, 4, with or without Wire Feed.

Screw Machines, Nos. 5, 6, 7, 8, Power Feed.

Presses, Nos. 51, 52, 53, Ferracute; Nos. 1, 2, 3, Stiles & Parker.

5 Lincoln Pattern Millers, No. 2.

Hand Millers, Nos. 1 and 2. 3 Cam Cutters.

Bolt Cutters, ¼ in. to 1 in., ½ in to 2 in.

2 Profiling Machines. 1 36 in. and 48 in. Gear Cutter.

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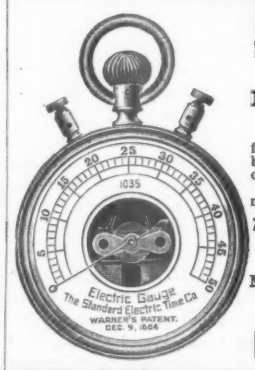
C. C. BARTLETT, Gen. Manager,
CLEVELAND, O.



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